WORLD PETROLEUM

THIRTY FIRST ANNUAL REFINERY REVIEW

JULY 15, 1961

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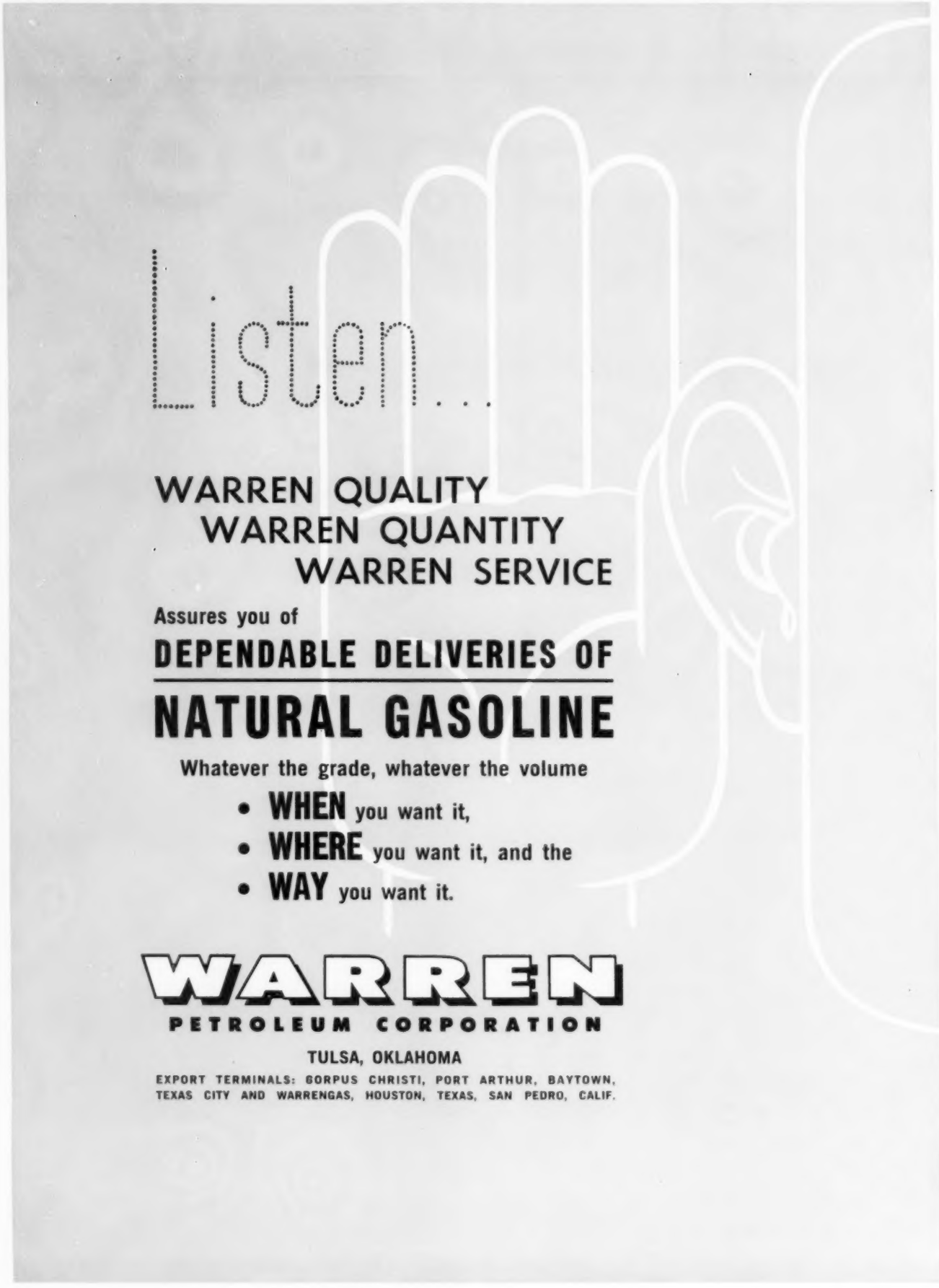

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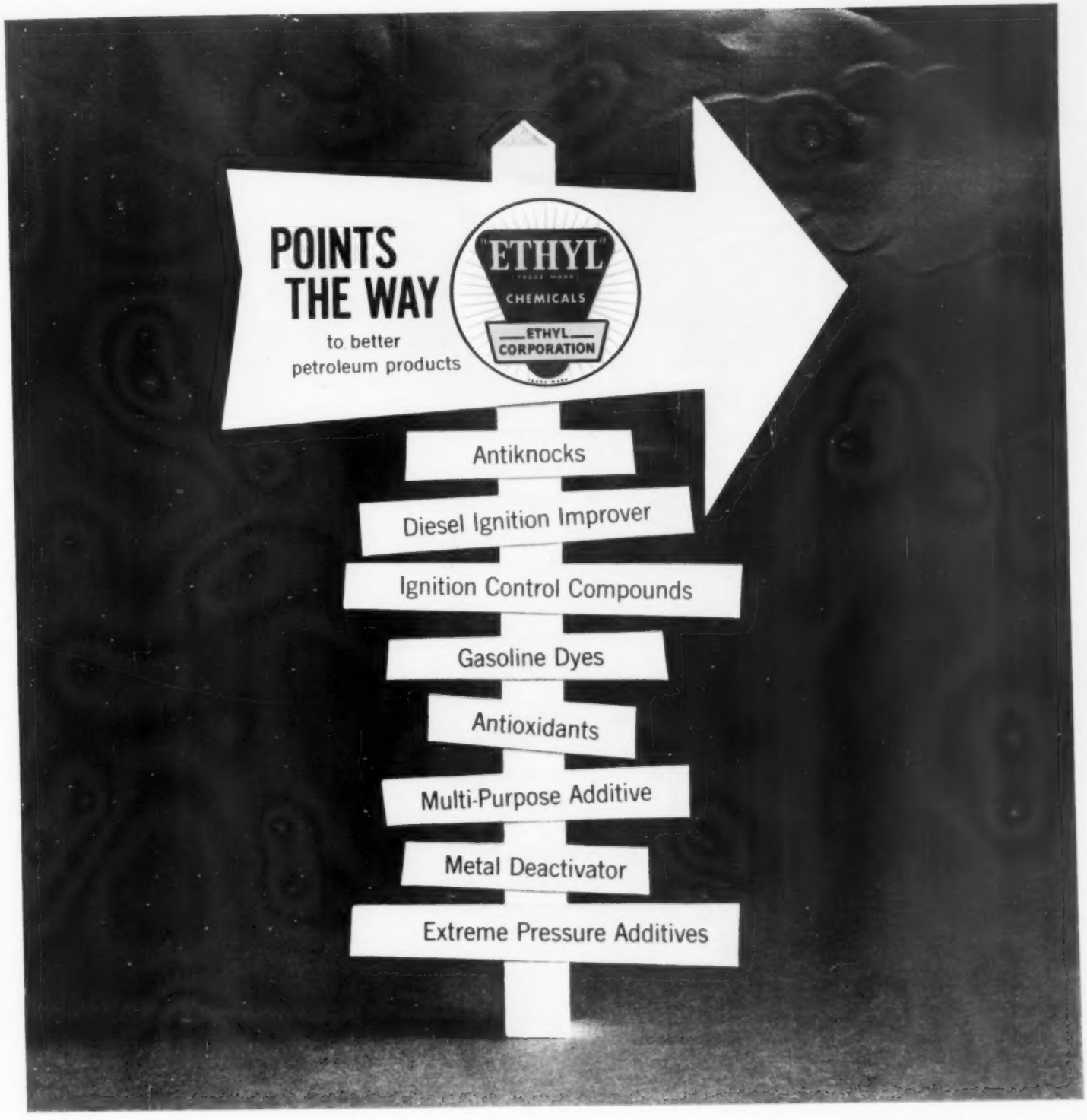

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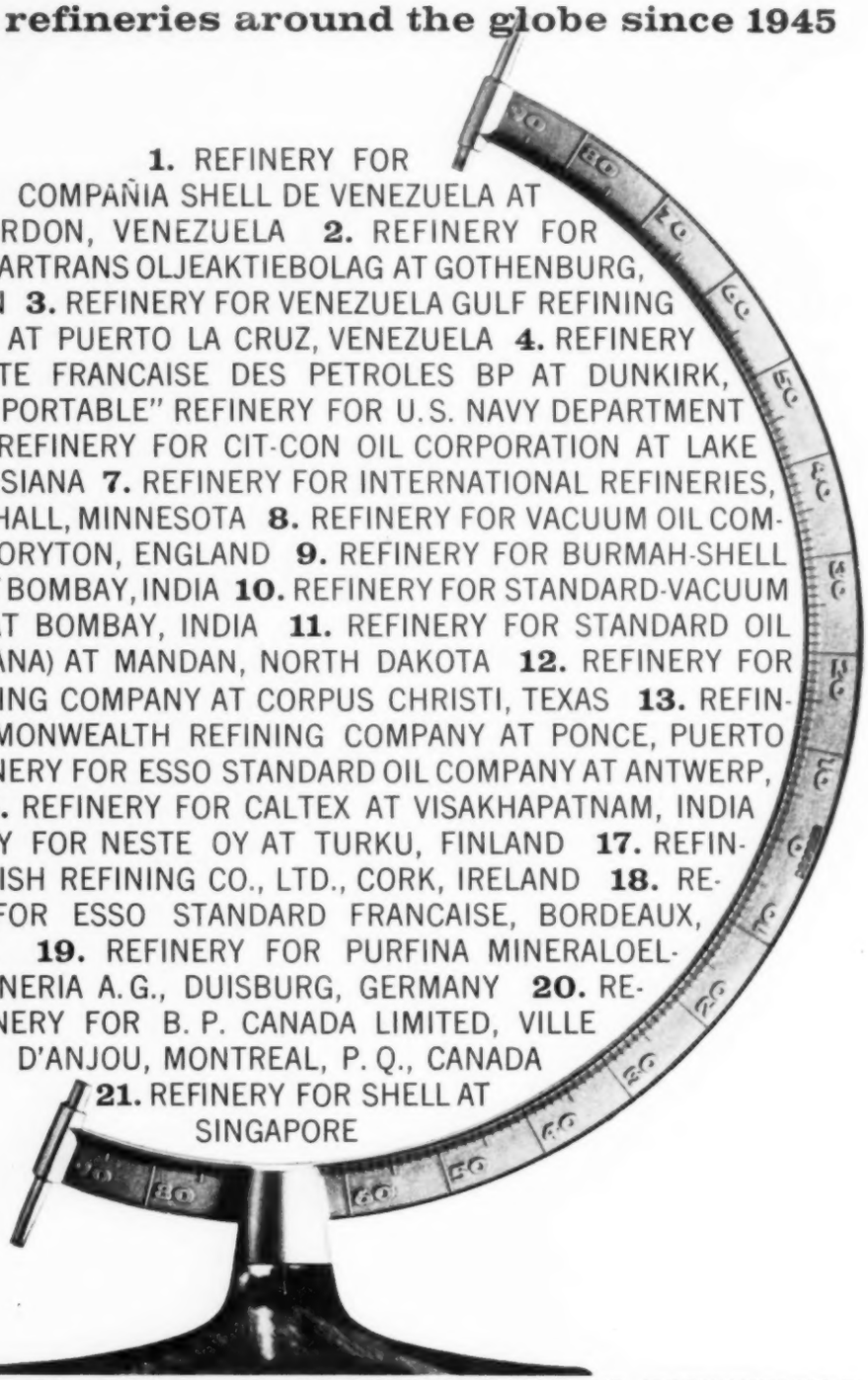

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World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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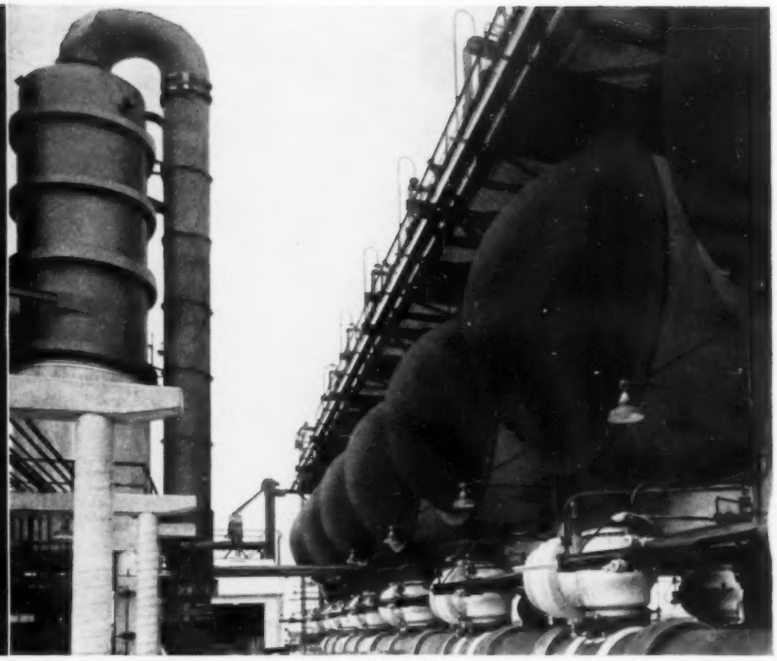
Striking late evening view of new cumene unit at Texaco, Inc.'s Eagle Point Works, Westville, N. J. Color plates are reproduced here through the courtesy of Gordon Bowman, editor, The TEXACO STAR.



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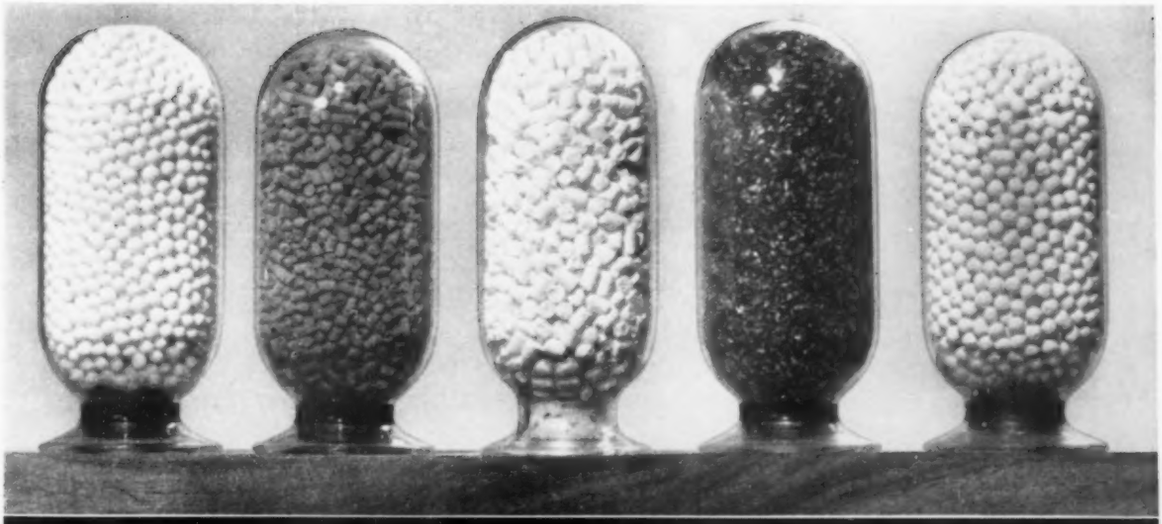

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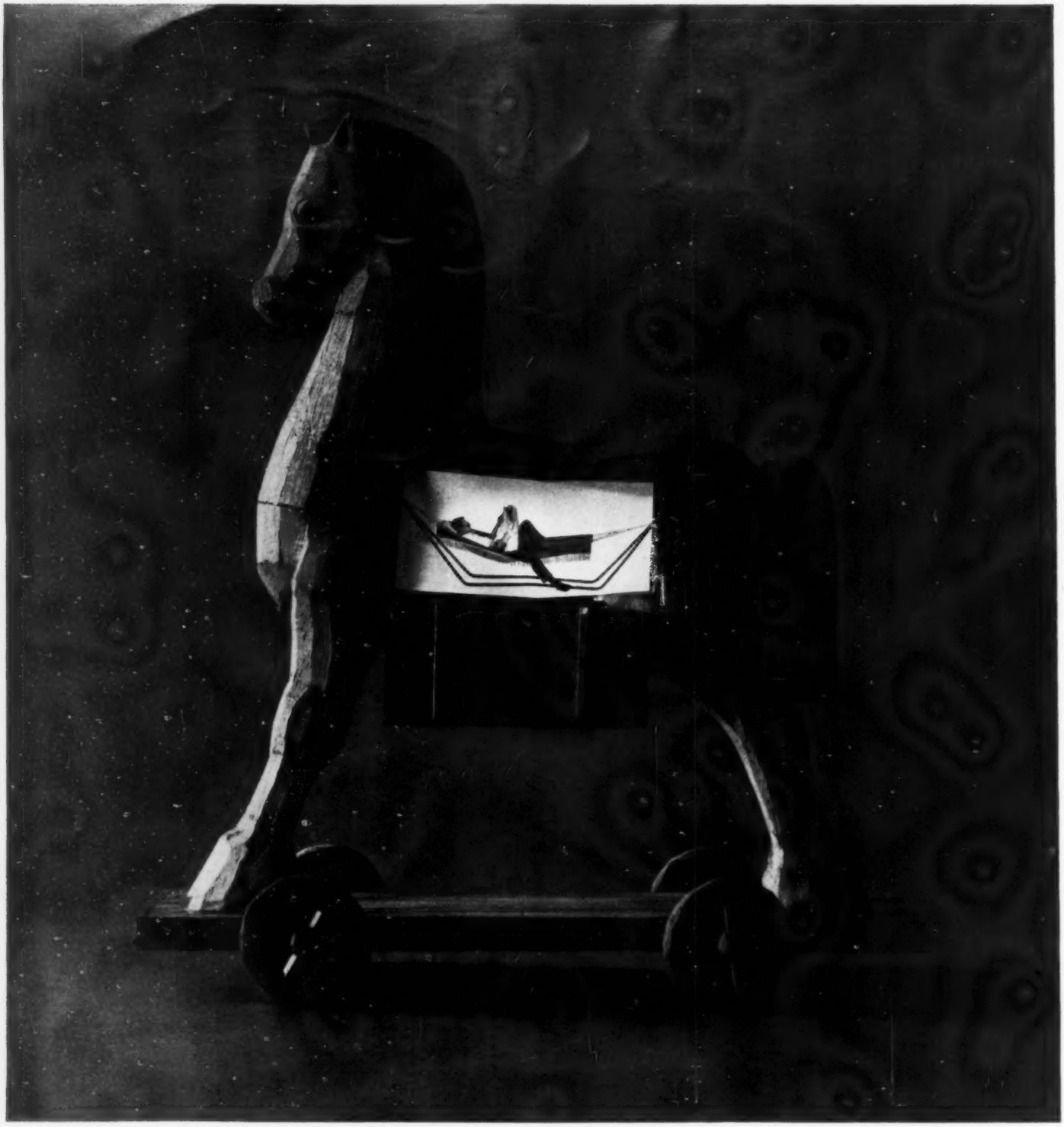

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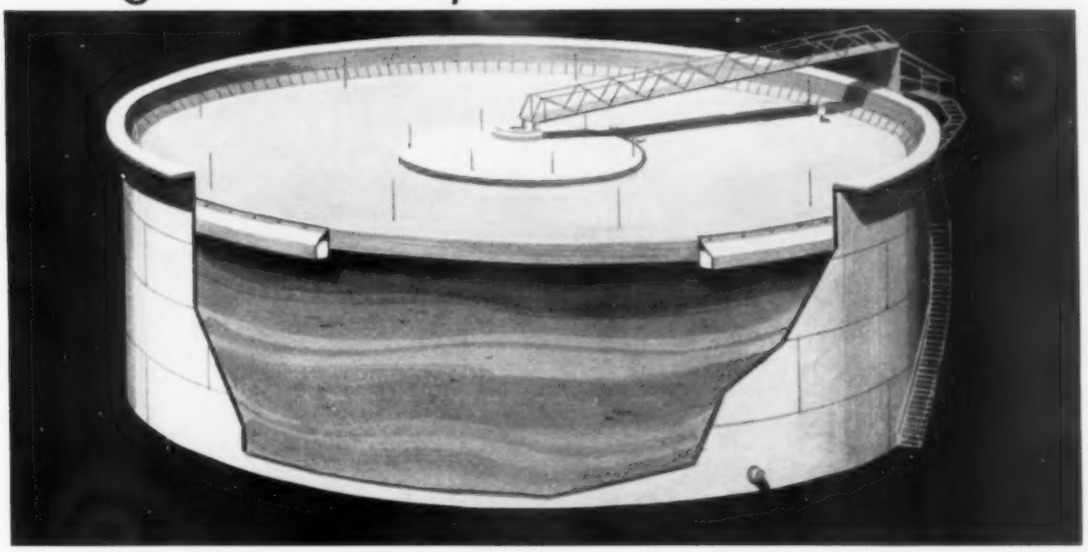

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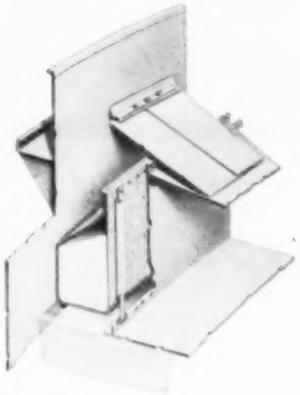

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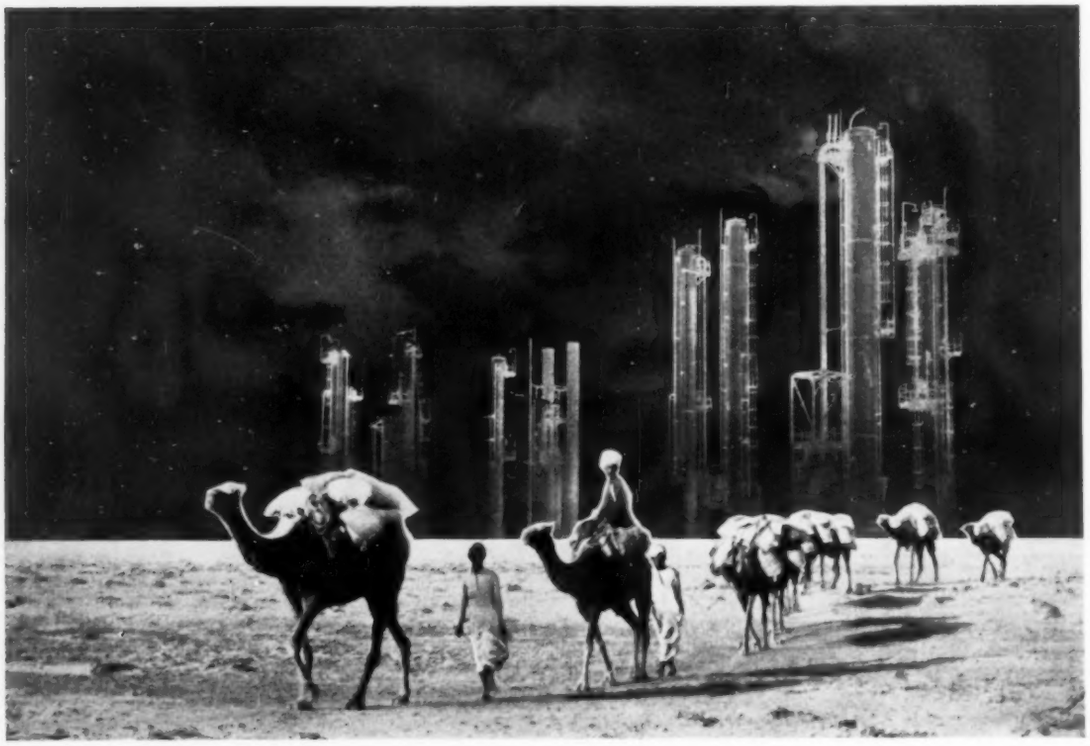

PAKISTAN'S FIRST OIL REFINERY NOW BEING BUILT BY KELLOGG

for British-Dutch-American consortium

Construction activities are well under way on Pakistan's first refinery, near Karachi. Simultaneously, details of procurement—a world-wide operation—are being coordinated in Kellogg offices. Completion of the project is scheduled for the latter part of 1962.

The Kellogg organization will be completely responsible for this 35,000 BPD refinery to Pakistan Refinery Limited. The Burmah Oil Company, Caltex, Shell, Stanvac, together with Pakistani interests, all participate in Pakistan Refinery Limited. Technical coordinator for the consortium is Bataafse Internationale Petroleum Maatschappij.

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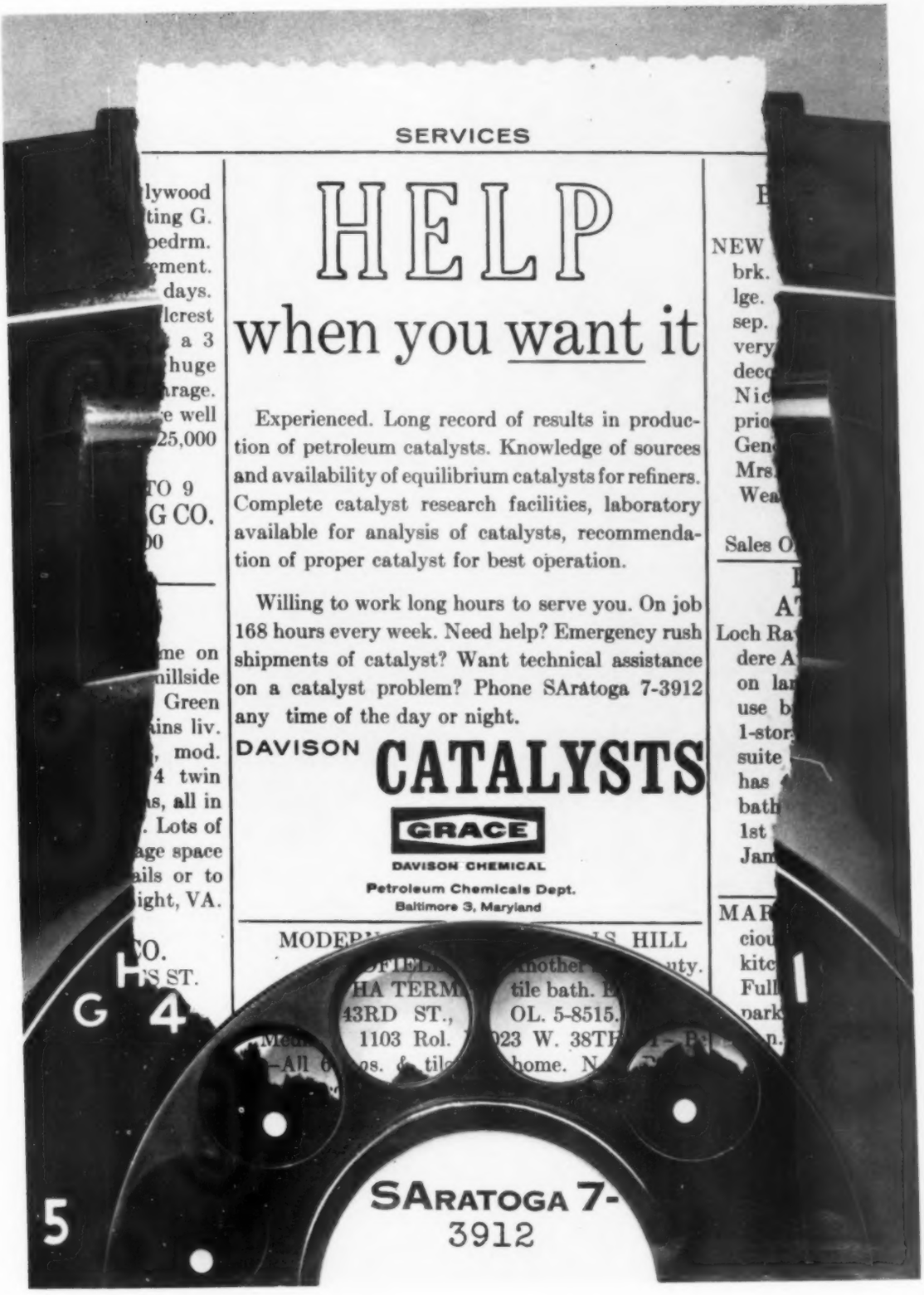
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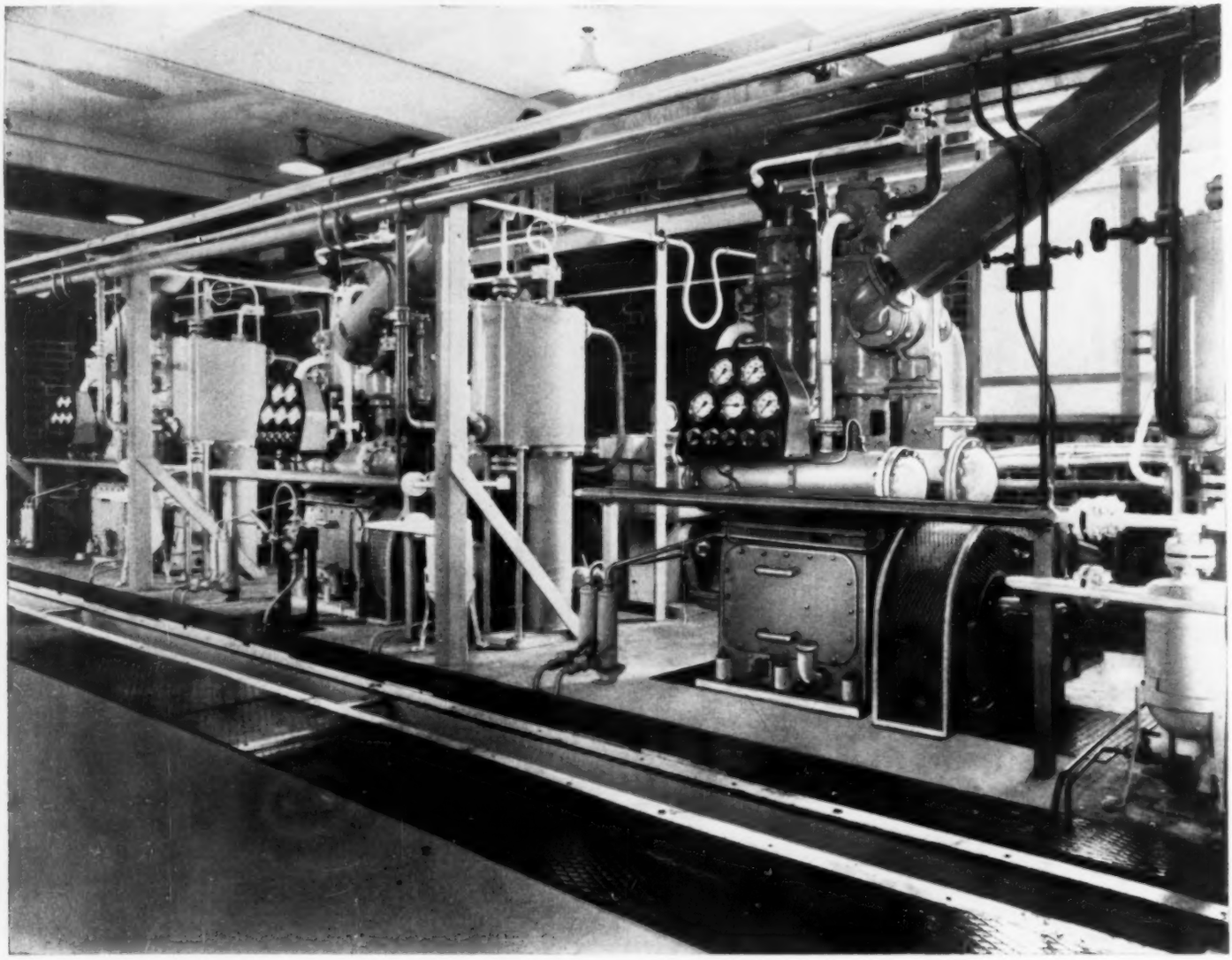

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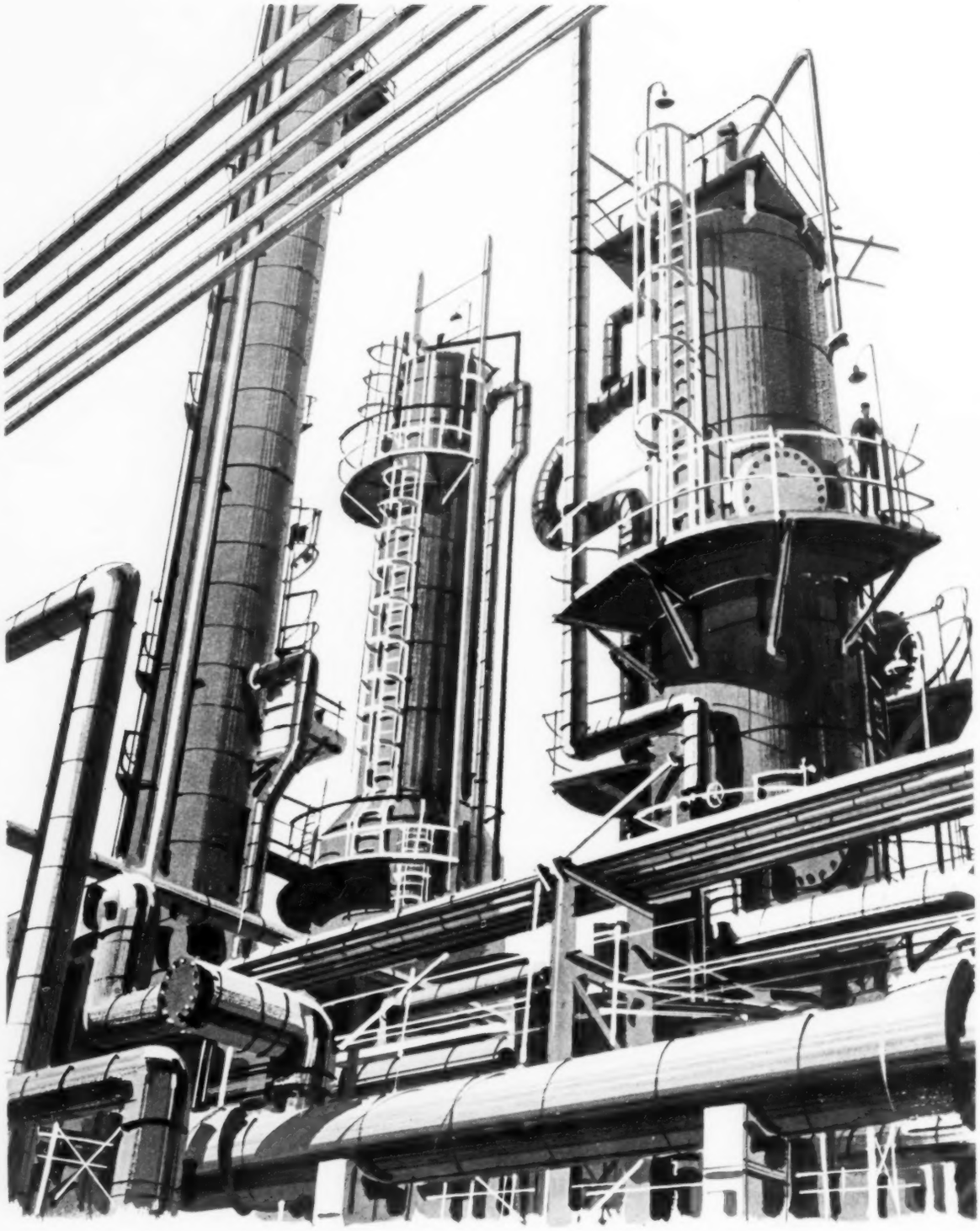

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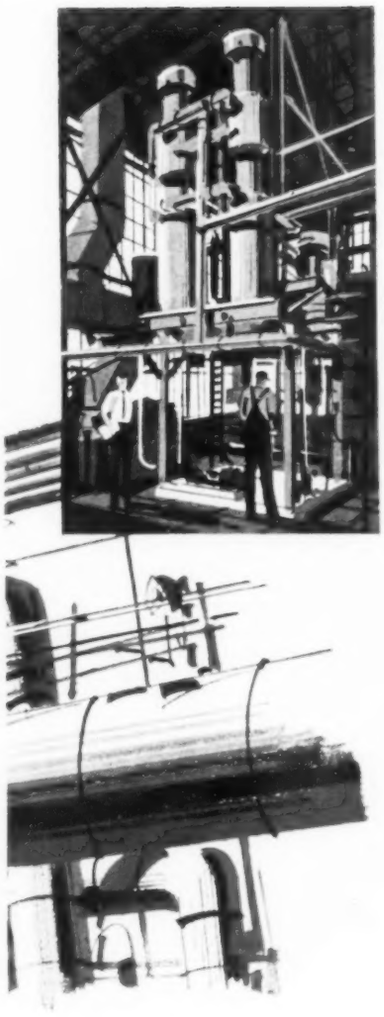

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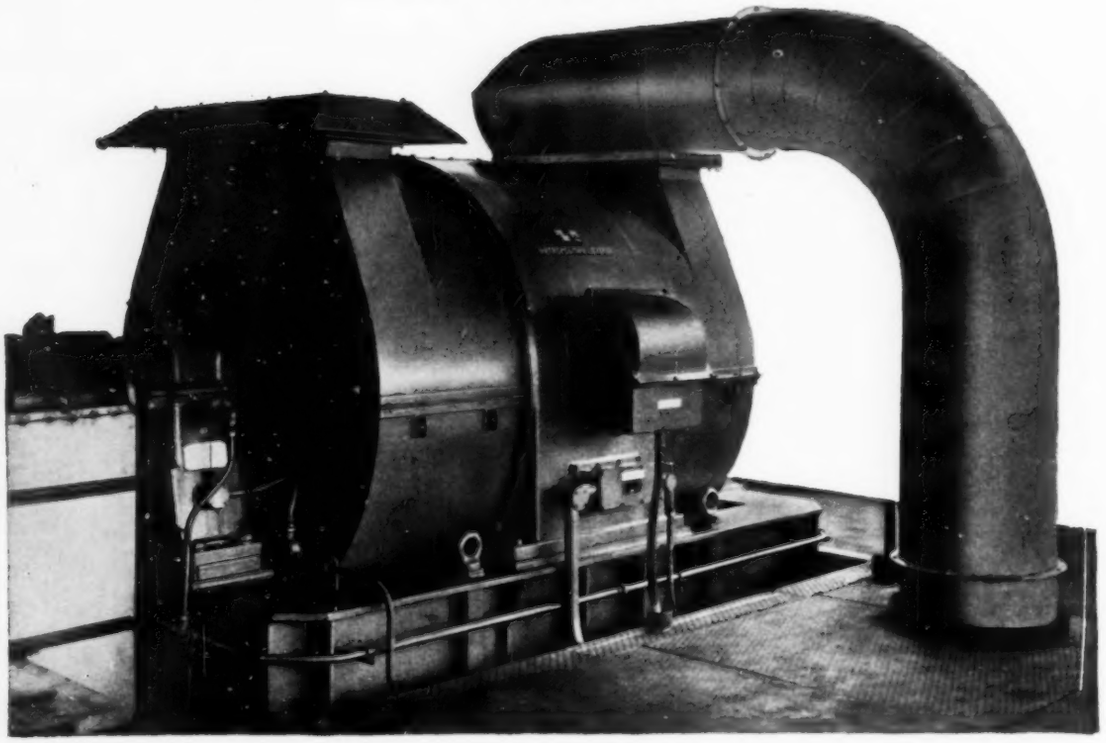

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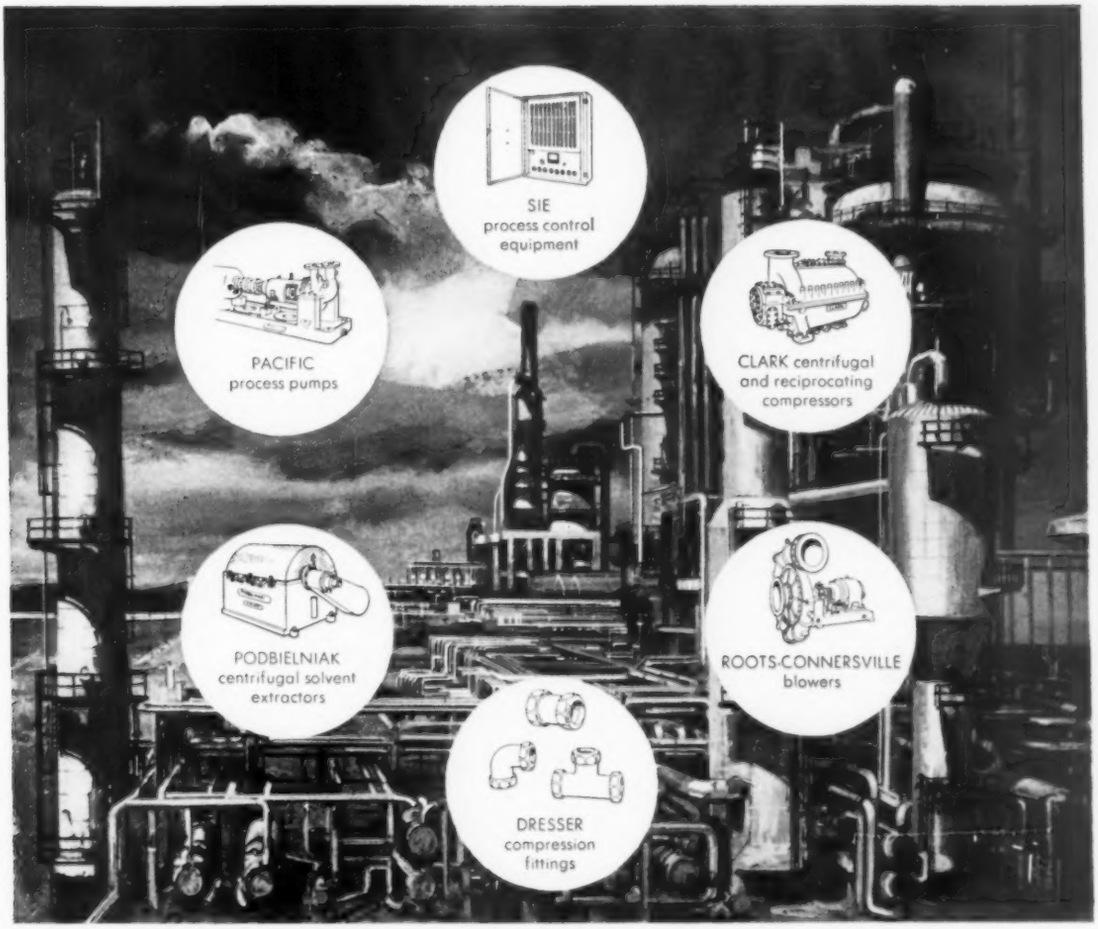

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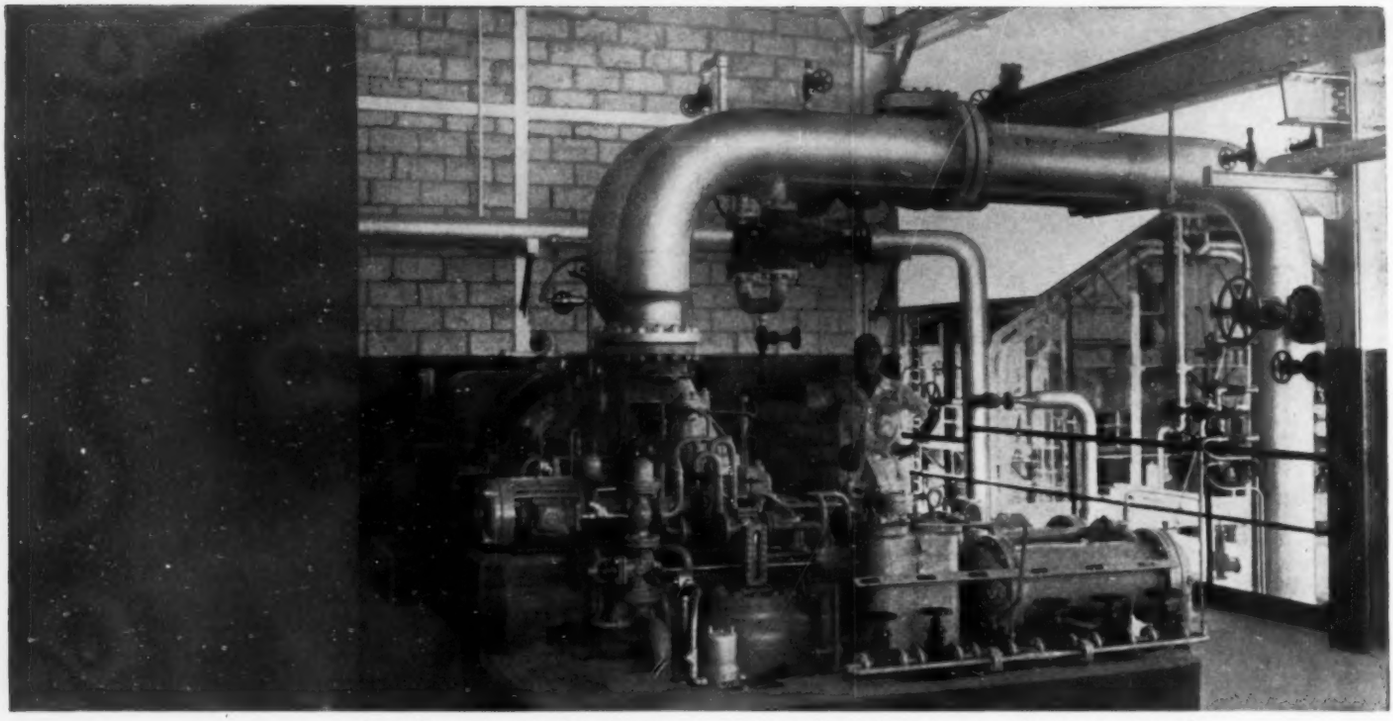
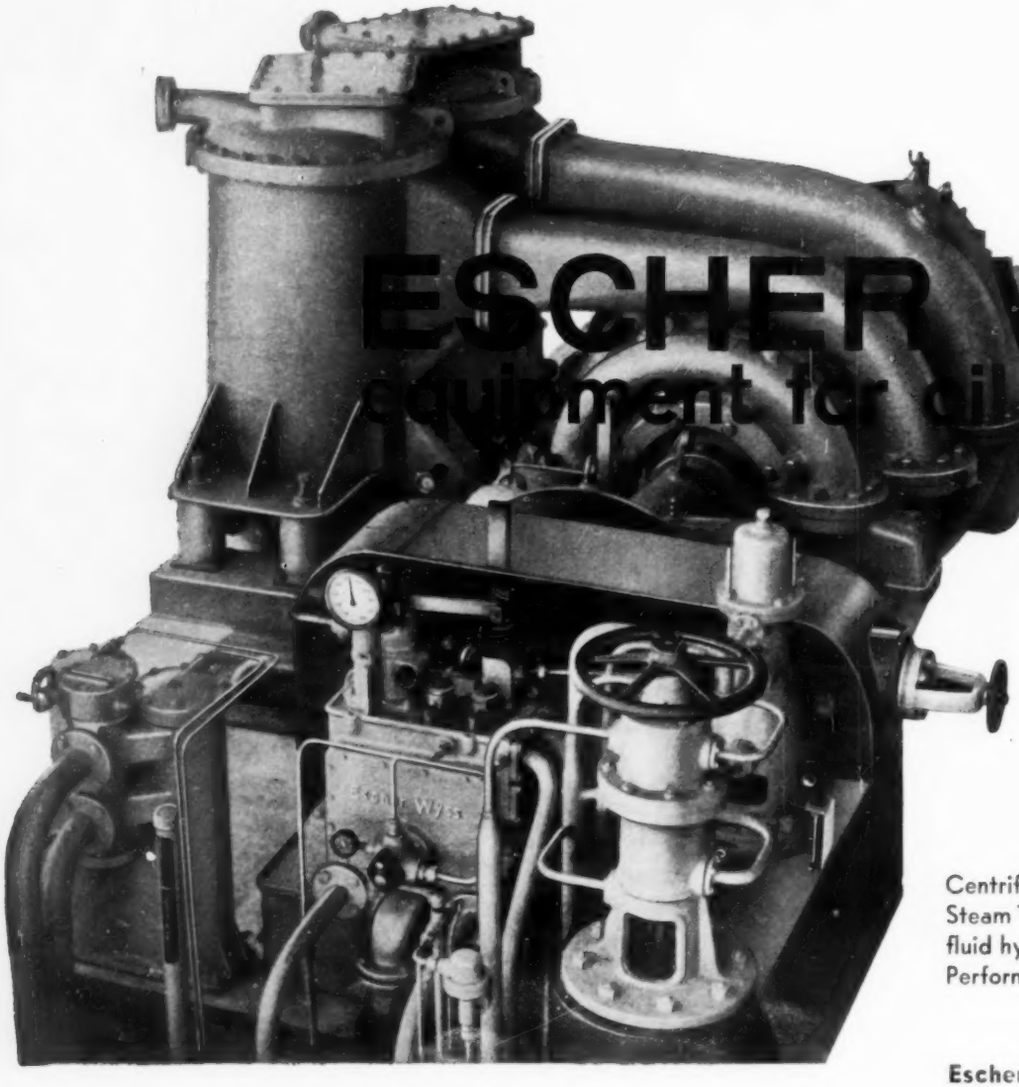


Centrifugal Recycle Gas Compressor with sealing oil system, installed in an oil refinery

ESCHER WYSS
equipment for oil refineries



Centrifugal Compressor with Condensing Steam Turbine, supplying combustion air to a fluid hydroformer installed in an oil refinery. Performance: 11,250 cfm, 260 psia, 8150 rpm

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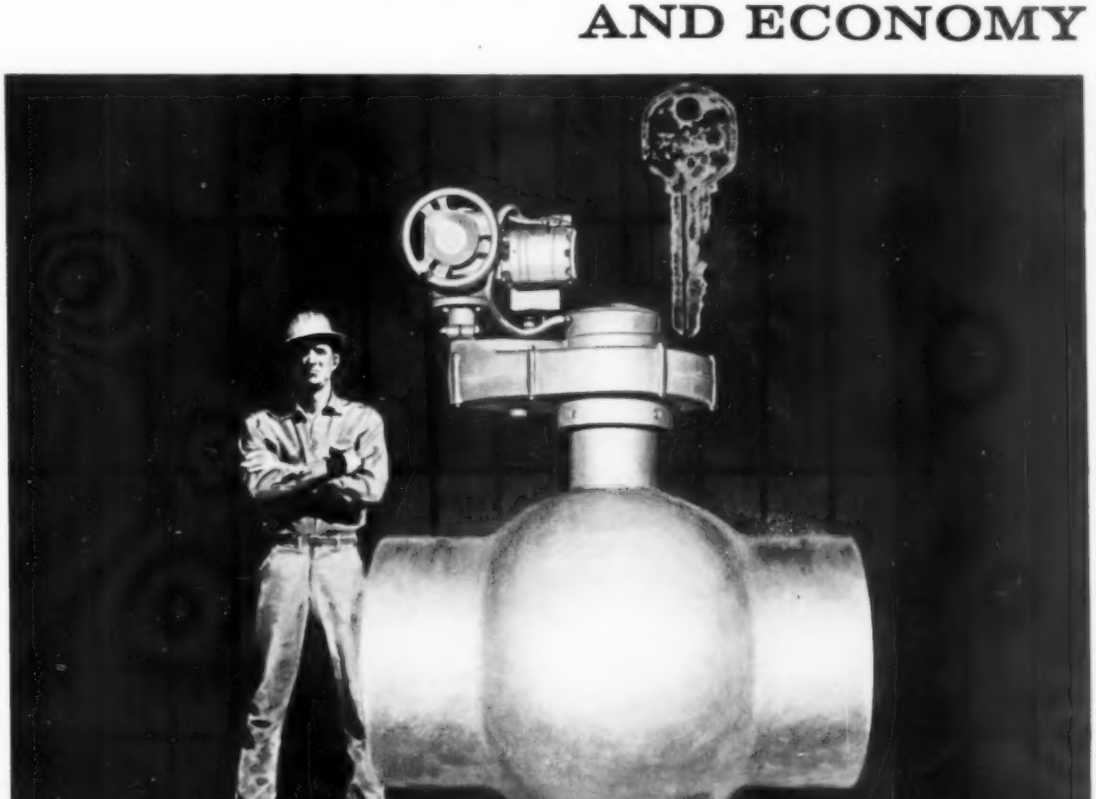

Cameron

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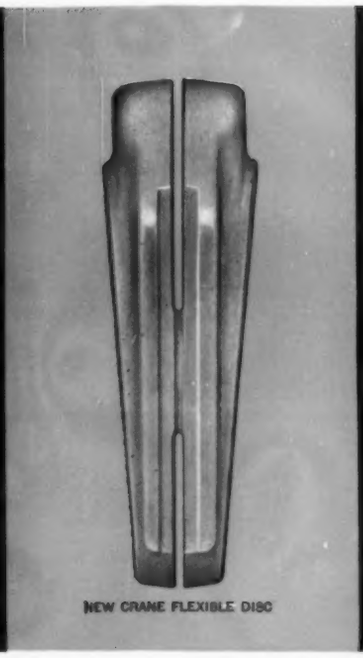
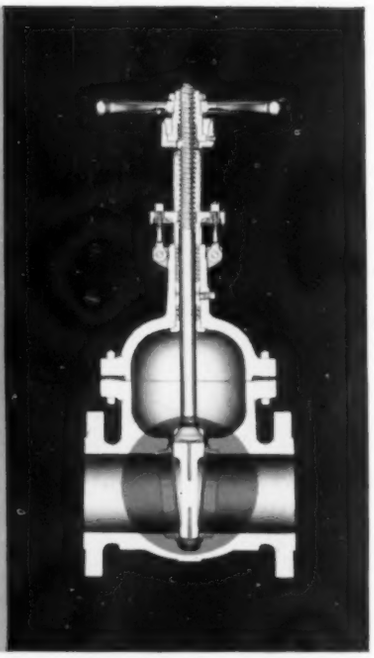
PROOF OF QUALITY

Every Crane product is checked for quality at every step of its production. Crane maintains the industry's most complete facilities for engineering, manufacturing and testing its products.



NEW CRANE FLEXIBLE DISC



New CRANE FLEX GATES eliminate sticking in oil operations... operate with less torque . . . outperform any conventional gate valve now in use

Crane Flex Gates are the most significant advance in gate valve design in 25 years! Instead of being made with a solid disc, Flex Gates have separate disc faces that flex slightly when seat faces are joined. This flexibility allows them to conform to the new position and compensates for any minor seat misalignment due to pipeline deflections.

Flex Gates can't stick when closed—even if closed while hot and allowed to cool. They stay tight on both faces over a wide range of pressures. Minimum operating torque is assured for both seating and unseating. Because they're flexible, body seat rings and faces can be serviced economically and quickly.

In some services one Flex Gate does the work of 2 conventional gate valves—saving substantially on piping costs. Extensive field tests show that Crane Flex Gates outperform any conventional solid wedge disc valve now in use.

They are ideally suited for oil, oil vapor, gas, steam or water service. Stem and disc seating faces are Crane Exelloy. Shoulder-type seat rings are Exelloy or Crane No. 49 Nickel Alloy. Where hard facing material for high temperature-pressure service is required, Stellite seat facings can be furnished.

For complete information on this new line of gate valves call your Crane Representative. Crane International makes available to you a complete line of valves from the source most desirable to you—based on price, geographical location and service.

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March of progress in petroleum processing...

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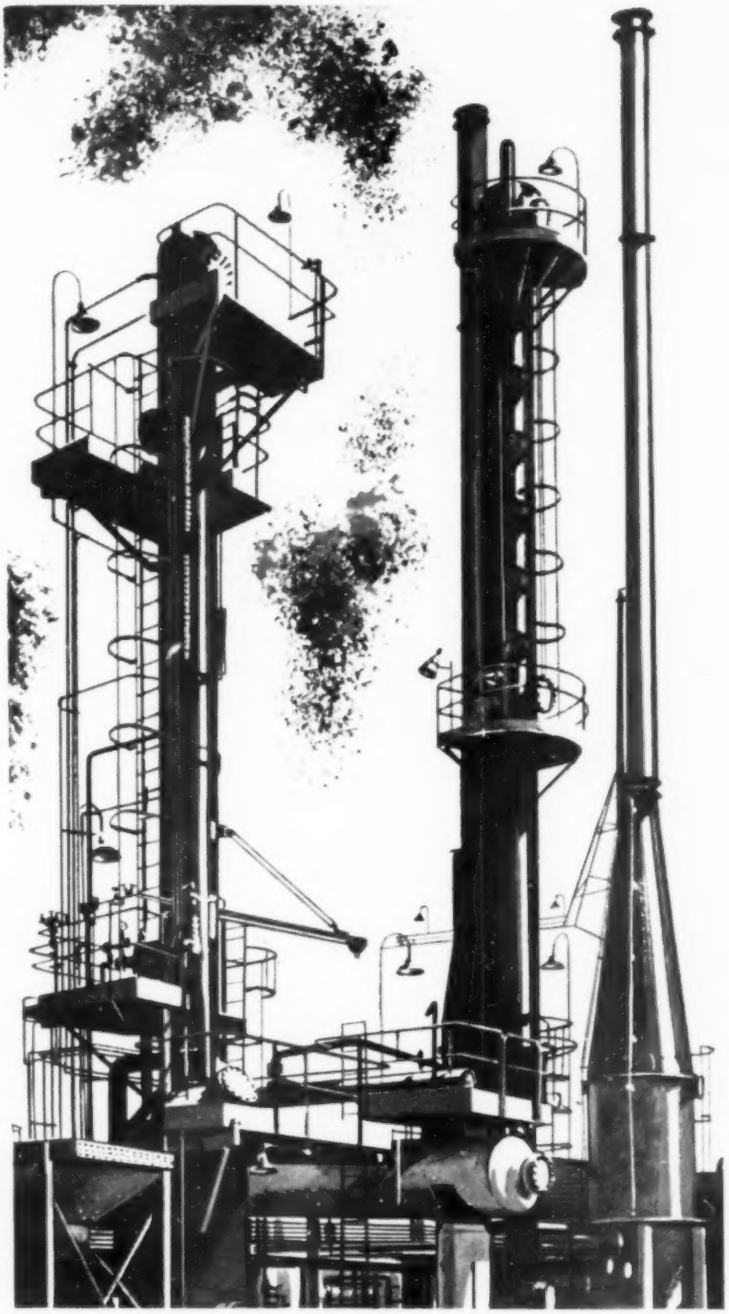
The 40's—CATALYTIC CRACKING!

The 50's—CATALYTIC REFORMING!

NOW...ISOCRACKING!



*Isocracking** is now applicable to straight run gas oils, catalytic cycle oils, thermal gas oils and coker distillates of higher end point than previously announced.

Refiners can produce high-quality gasolines and jet fuels from refractory distillates . . . at lower investment and operating costs than were ever thought possible by hydrocracking.

The benefits of *Isocracking* have been proved commercially in the Richmond, California plant, now in its second year of full-scale operation.

Another large plant is under construction and a third is on the drawing boards. Here is evidence of an attractive return on investment.

For complete details, write:
California Research Corporation
200 Bush St., San Francisco 20, Calif.

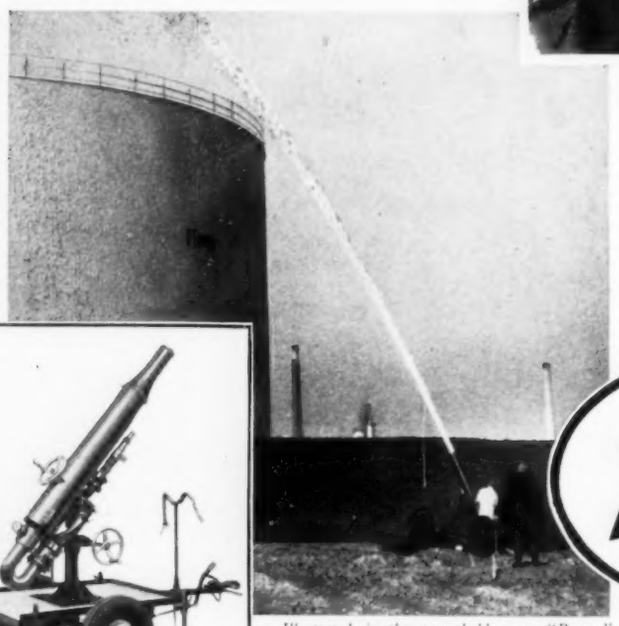
CALIFORNIA RESEARCH CORPORATION
A Standard Oil Company of California Subsidiary

*Proprietary Name

fire* security

in the oil world

Throughout the whole field of the oil industry, the assurance of *complete* protection from *all* fire risks is a vital asset. The Factories Act lays down that *appropriate* means of fire fighting must be provided and maintained—but for every reason of productivity, morale and safeguard from loss, the regulations are best fulfilled by the latest and most efficient protection available. "Pyrene" Fire Fighting Appliances provide oil companies with the most specialised and complete fire protection, including "Pyrene" Mechanical Foam, CO_2 and Dry Chemical Equipment, Fire Fighting Vehicles and other advanced forms of fire protection for oils and spirits stored in bulk. Fire Safety Equipment for oil tankers and oil jetties is also included in the wide "Pyrene" range of fire appliances.



Illustrated is the remarkable new "Pyrene" Super-jet Foam Monitor capable of throwing a foam jet 75 feet high at 5,000 g.p.m. A dual-purpose foam/water fire-fighting unit, it is easily towed by a light vehicle and man-handled into position.

*Ask the man who knows

All over the world, men charged with the responsibility for fire protection will tell you that the safest answer to any fire problem is to get in touch with The Pyrene Company—and get the right advice backed by 47 years of fire fighting development. Please write to Dept. WP7

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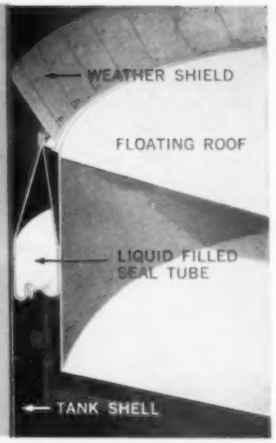
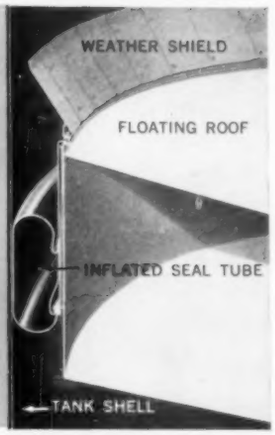
SR5 / HORTON
LIQUID FILLED FABRIC SEAL

- Sealing liquid holds envelope against tank shell.
- Pressure against shell is greatest at bottom, decreasing to zero at top of contact.
- Flexible ring support provides adequate clearance and better fit for all rim space variations.
- Sealing band and rim band vulcanized at bottom connection.



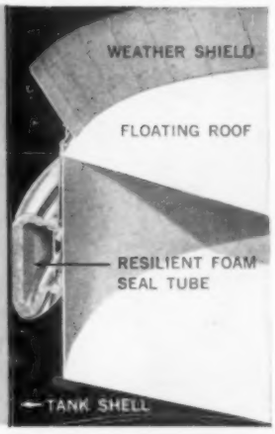
SR6 / HORTON
INFLATED FABRIC SEAL

- Gas holds envelope against tank shell.
- Constant mild pressure, maintained by simple gasholder, over entire surface.
- Positive means of supplying seal gas.
- Maximum clearance to accommodate rim space variations due to badly out-of-round shells.
- Vulcanized to form endless tube.
- Can be serviced from top of roof.



SR7 / HORTON
RESILIENT FOAM FABRIC SEAL

- Resilient foam holds envelope against tank shell.
- Mild and positive pressure against tank shell.
- Maximum clearance to accommodate rim space variations due to badly out-of-round shells.
- Endless sheet covers resilient foam, forming tight envelope.
- Can be serviced from top of roof.



SR3 / HORTON
METALLIC SEAL

- Continuous steel sealing ring.
- Pantagraph hangers hold sealing ring against tank shell with minimum pressure.
- Hangers keep roof centered in tank.
- Continuous seal closes rim space.

Widest Choice of Seals for Floating Roof Tanks

Because CB&I seals so successfully reduce evaporation, retard corrosion and minimize fire hazards, more CB&I floating roof seals are in use than all other designs. Four of the most popular CB&I seals are illustrated here. CB&I offers the widest selection. Talk over your requirements, for new or existing tanks, with CB&I. The most efficient design for your installation will be recommended.

CB&I's extensive experience (since 1922) with all types of sealing designs is at your disposal

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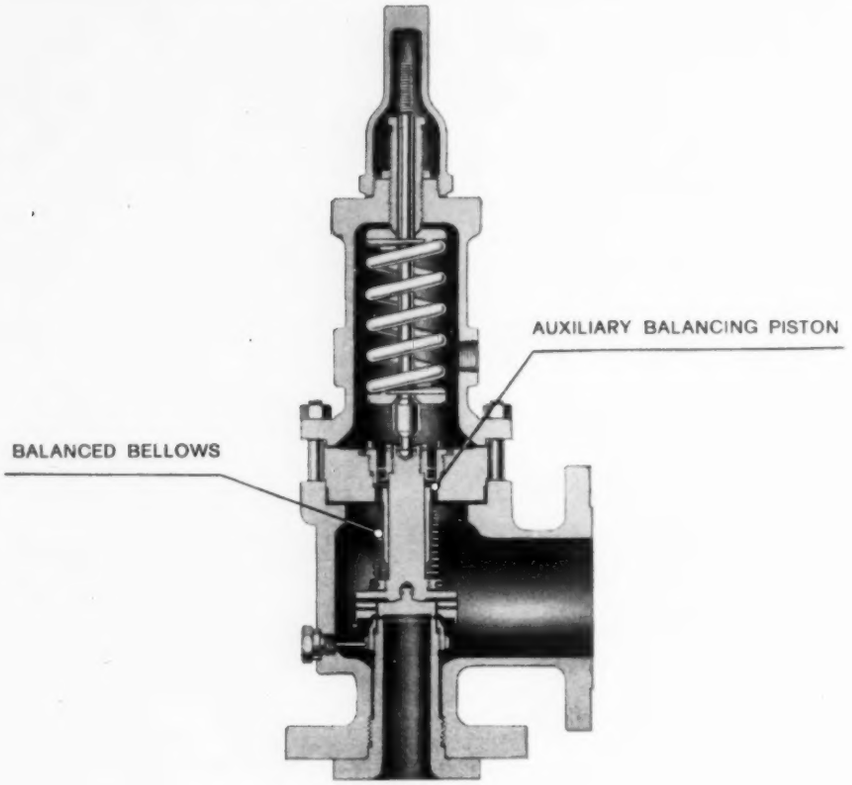
CB-6116

Consolidated Bellows Relief Valves With Auxiliary Balancing Piston Guarantee Maximum Protection



IN ENGLAND

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Ashcroft Duragauges
Ashcroft Pneumatic Transmitters
Consolidated Safety Relief Valves
Consolidated Safety Valves
Consolidated "Maxiflow" Safety Valves
Consolidated "Electromatic" Relief Valves

IN CANADA

Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

Ashcroft Gauges
Consolidated Safety and Safety Relief Valves
Hancock Bronze and Steel Valves
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IN FRANCE

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Consolidated Safety Relief Valves
Hancock Steel Gate and Globe Valves
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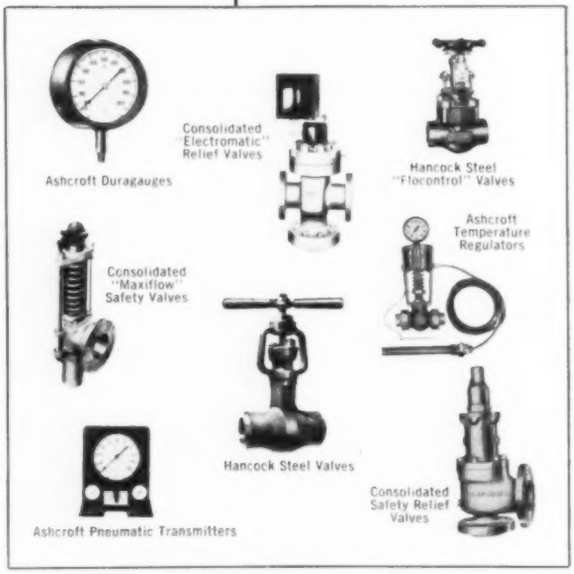
Consolidated Safety Relief Valves
Consolidated Safety Valves
Consolidated "Maxiflow" Safety Valves

Since their introduction in 1958, Consolidated Safety Relief Valves with Balanced Bellows and Auxiliary Balancing Piston have been providing the ultimate in positive protection.

The Consolidated Bellows Seal reduces the effect of back pressure on performance characteristics such as capacity, set pressure, and reseating pressure. If the bellows ruptures, the Balancing Piston directly above it immediately re-establishes the pressure balance. Performance characteristics of the valve remain the same as when the bellows was intact.

You can be sure of peak performance and maximum protection with Consolidated Safety Relief Valves, Bellows and conventional designs.

Licensees, listed above right, welcome the opportunity to assist you. Meeting the world-wide demand for valves, pressure gauges and pneumatic transmitters, industrial thermometers and temperature regulators, they will gladly supply specific product information and application data. Write for Bulletin 1935 for information concerning Consolidated Safety Relief Valves with Balanced Bellows and Auxiliary Balancing Piston.



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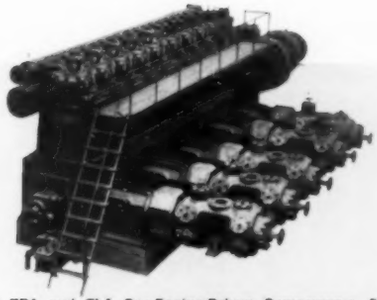
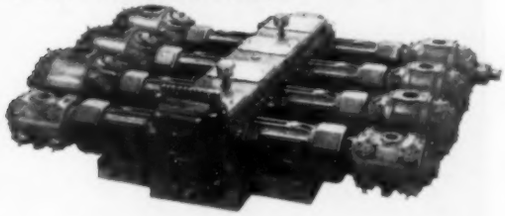
All Areas Except Western Hemisphere: Manning, Maxwell & Moore, S. A., Fribourg, Switzerland
Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
Latin America: Export Division, Chrysler Bldg., New York, N. Y.

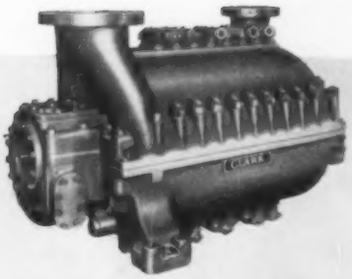


Models TRA and TLA Gas-Engine-Driven Compressors—2-cycle, turbocharged. Ideal where large blocks of horsepower are required. They offer maximum power per unit of floor space, as well as excellent fuel economy. Model TRA is available with 6, 8, and 10 cylinders, 1100 to 1800 bhp. Model TLA is available with 5, 6, 8, and 10 cylinders, 1700 to 3400 bhp.

RECIPROCATING



Models CLBA, CLRA, CJA, CMB, CMA and CFA Motor-Driven Compressors for heavy duty process applications. These balanced/opposed compressors are built in seven stroke sizes—6", 8", 8¾", 11", 14", 17" and 19". Available with 2 to 10 compressor cylinders depending on model chosen. Pressures from vacuum to over 36,000 psi.



Type HS Horizontally-Split Centrifugal Compressors are highly dependable multi-stage units used extensively in petroleum processing. Seven case sizes are available in capacities ranging to over 150,000 cfm. Up to ten stages of compression in a single case. Cooled or uncooled types available to meet process requirements.

CENTRIFUGAL

Type VS Vertically-Split Centrifugal Compressors are multi-stage units designed for extremely high pressures—to over 5,000 psig. Four case sizes have a capacity range from 200 discharge cfm to 20,000 suction cfm. Barrel-like outer case provides maximum strength. Inner case is horizontally split for easy accessibility

CLARK COMPRESSORS

as international as the world-wide petroleum processing industry

Wherever petroleum is processed, you will find Clark compressors on the job or readily available. The complete line of Clark centrifugal and reciprocating compressors, with motor and gas engine drives, are manufactured in the U.S.A. and under license in Europe. Regardless of where manufactured, all Clark units and components are identical and completely interchangeable. Whether they carry the name plate of Clark (U.S.A.), Weir-Clark (Great Britain), Dujardin-Clark (France), CDT-Clark or CNR-Clark (Italy), they are the same efficient Clark compressors, designed and built to provide a lifetime of dependable service with minimum maintenance. All are guaranteed by Clark. For complete performance and application data, write to the offices listed below:

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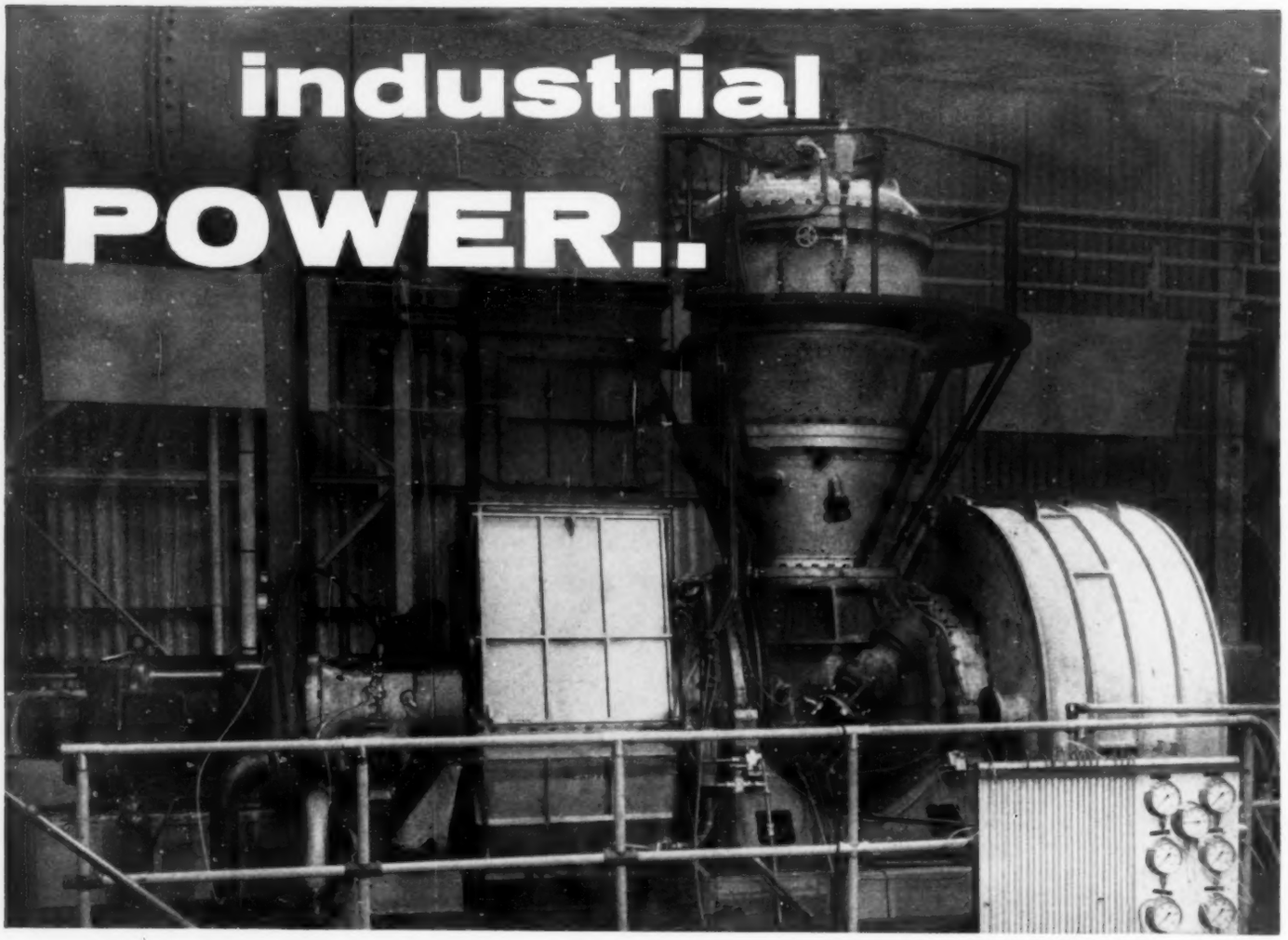
COMPACT industrial POWER..



An 'ENGLISH ELECTRIC' EM85 gas turbine undergoing works test. This is one of seven units being supplied to the Iraq and Basrah Petroleum Companies for pump drives.

'ENGLISH ELECTRIC'

industrial gas turbines

The 8,000-9,000 h.p. 'ENGLISH ELECTRIC' EM85 gas turbine—only 21 ft. long—is, for this power, one of the most compact two-shaft industrial units available. This multi-purpose turbine, operating efficiently over a wide range of output speeds, has an attractive fuel consumption and embodies experience gained with earlier designs ranging from 3,000 h.p. to 28,000 h.p. The exceptionally small size of the EM85 and the absence of reciprocating parts keep building and foundation costs low.

For technical details, send for Publication GT.104:
The ENGLISH ELECTRIC Company Limited,
Gas Turbine Division, Whetstone, Leicestershire.

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designed by
California Research Corporation
for upgrading distillates
to premium high octane gasoline
will be constructed for
The Standard Oil Company (Ohio) in Toledo.

ENGINEERING, PROCUREMENT and CONSTRUCTION

of this new low temperature hydrocracking unit, rated at 7,500 BPD, is the responsibility of

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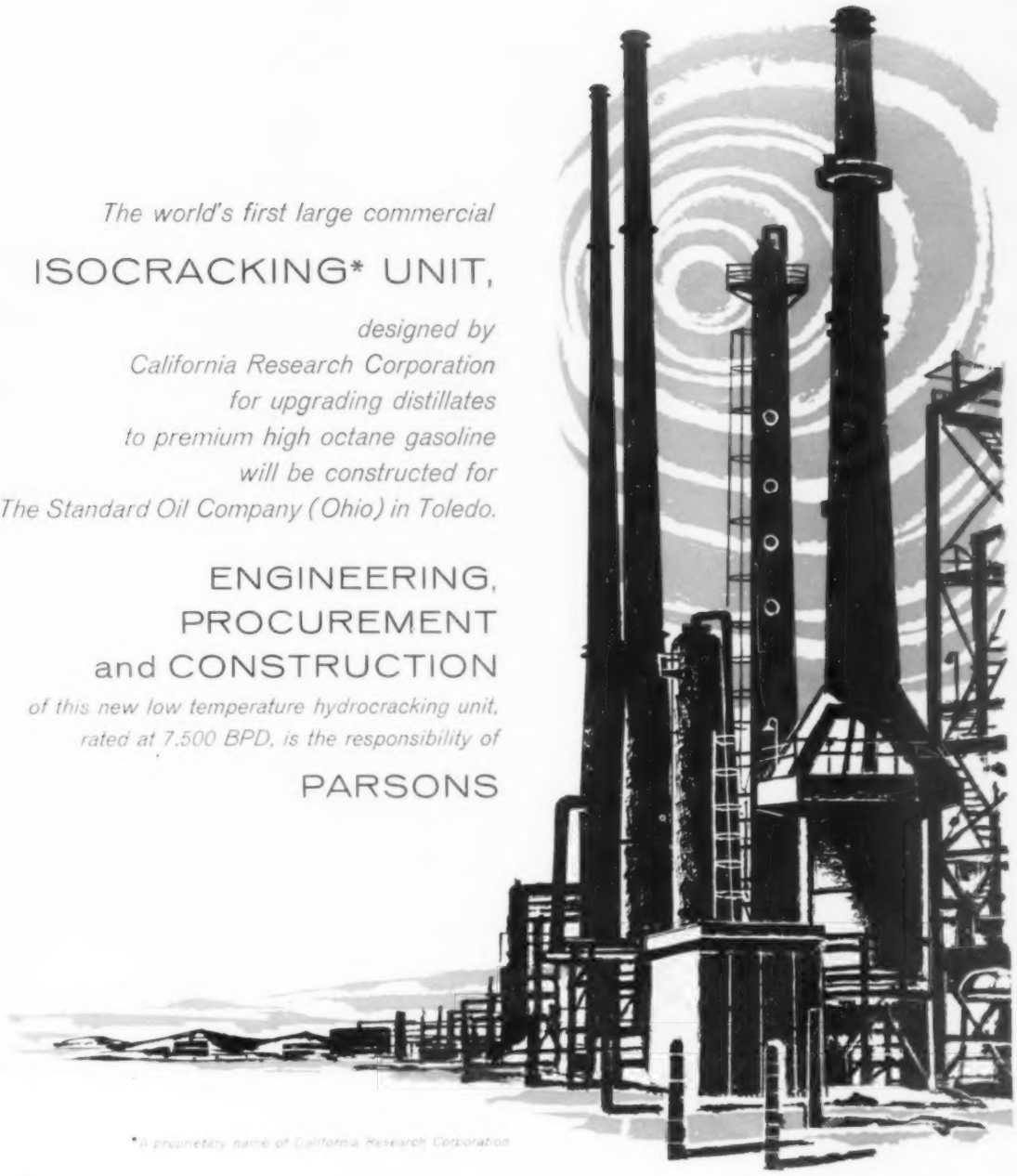

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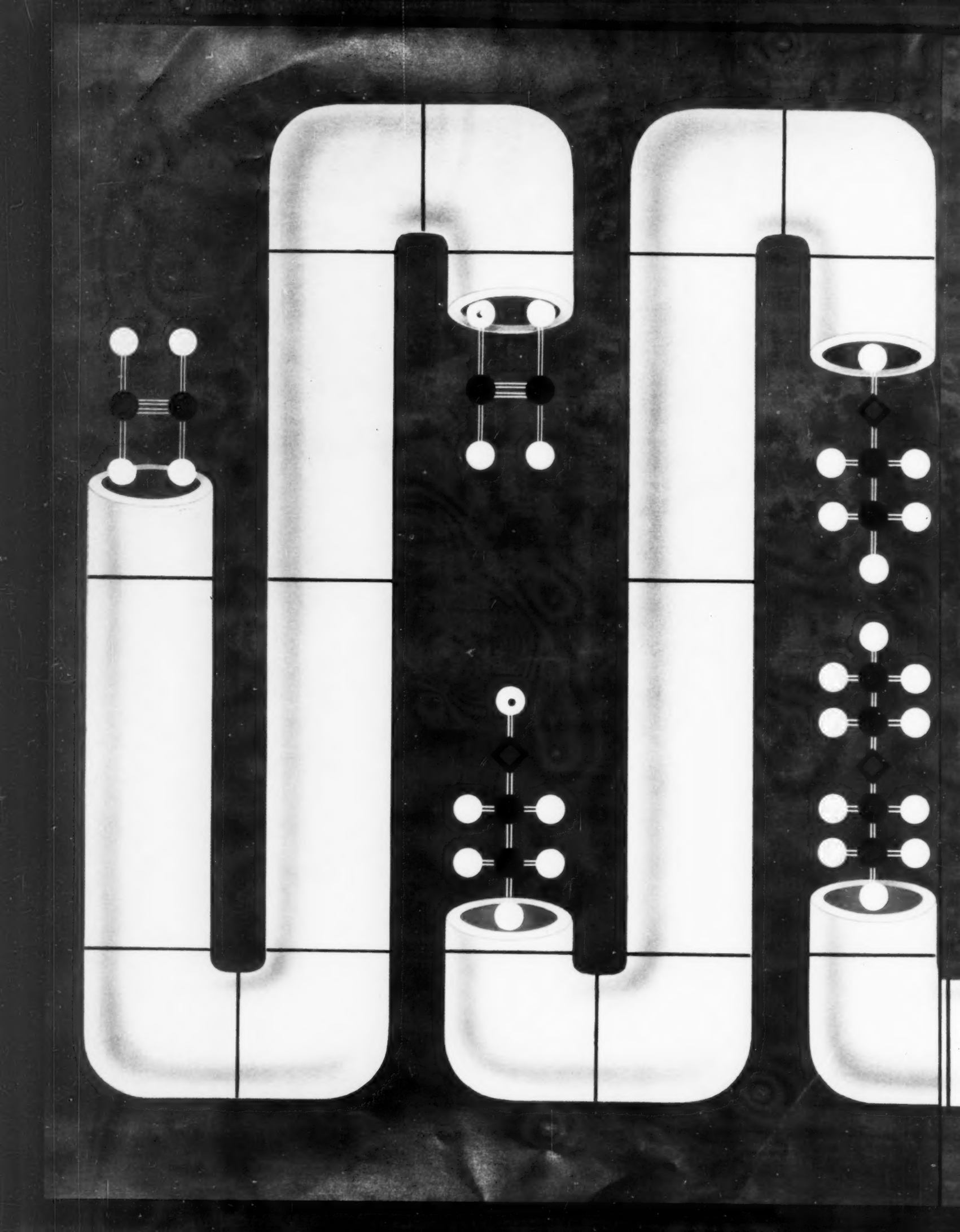

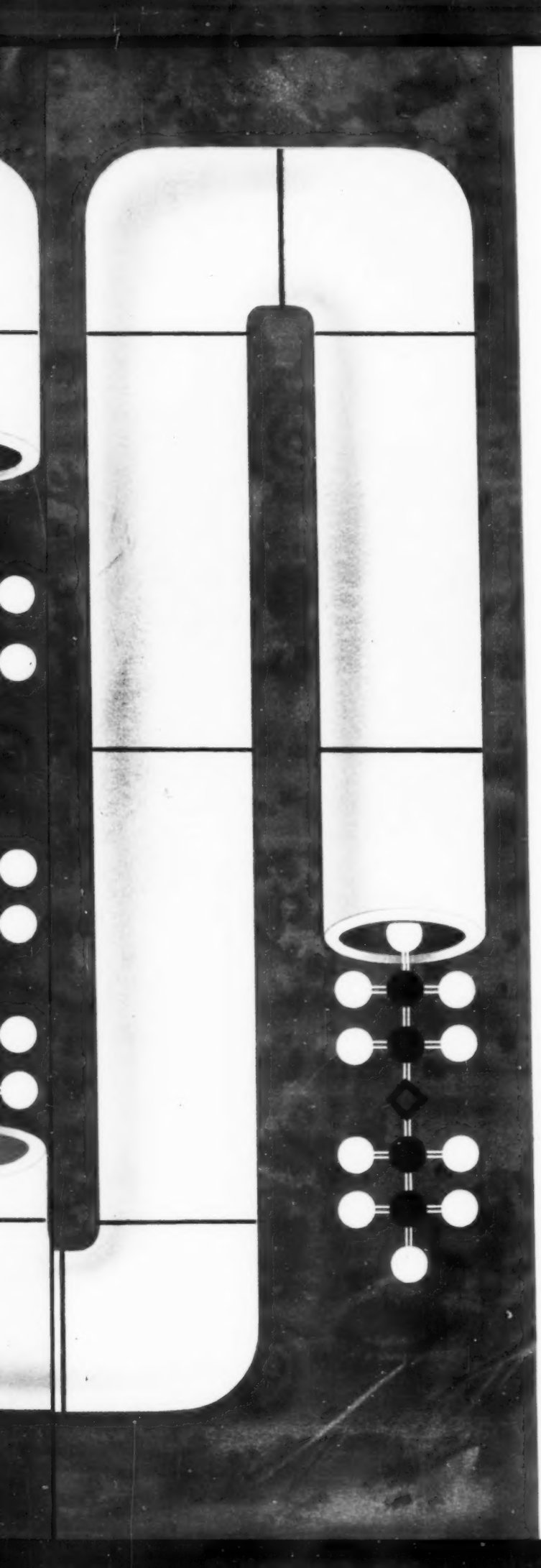

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Caposite fulfils every insulation requirement in petroleum refineries and other plant where relatively slight heat loss could be critical. Caposite pure Amosite Asbestos moulded insulation combines extremely low heat transmission with great mechanical strength. It is cheap, light and very clean, easily applied and stays in place permanently.

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Telephone: GROsvenor 6022 Cables: Incorrupt London

or to
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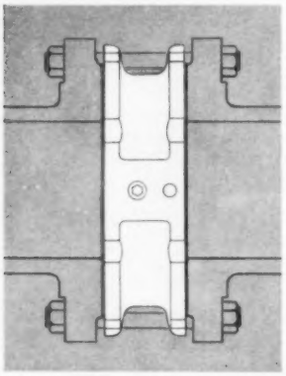
CAPE

TA1464

The Duo-Chek® is easily lowered into position between the flange faces; because of its light weight, special handling equipment is unnecessary. Fits standard valve flanges. In sizes 2 inch through 12 inch, one valve fits series 125, series 150 and series 300 flanges, saving inventory at less cost than a conventional 150 series. The machined outside diameter centers the Duo-Chek between series 300 flanges; the slots center it for series 150 flanges.



PAT. PENDING

MISSION DUO-CHEK NO SLAM CHECK VALVE

If your check valve problem is water hammer, Duo-Chek is the answer. If it's weight, maintenance, mounting position, or cost, Duo-Chek is still the right answer. The Duo-Chek performs all regular check valve duties, yet weighs only ten per cent as much.

The spring loaded, light weight sealing plates operate in any position—even in vertical lines with downward flow. The stainless steel coil spring effects positive sealing action. The quick action of the spring closes the valve before reverse flow can occur; therefore, no slam, no water hammer.

Duo-Chek valves come in a complete range of end connections and sizes from 2 to 48 inches, for ASA pressure ratings of series 125 through 2500, and for temperatures to 1400°F. They are made in steel, stainless steel, aluminum, and bronze. Sealing materials are Buna-N, Teflon, Viton, or metal depending on your service.

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MISSION VALVE AND PUMP CO.

ALL FLOATING ROOF TANKS ARE FULLY EQUIPPED, **BUT...**

Only Tubeseal Has Lightning-Proof, Electro-Conductive Weather Shield

PATENTED

Tubeseal electro-conductive weather shields are an *exclusive tried and proved development.* They provide positive protection against lightning-caused rim fires. ■ How? By maintaining a *continuous* grounding bond between roof deck and shell—concentration of static charges is impossible. There has *never* been a lightning fire where any of the many hundreds of Tubeseal System Floating Roof Tanks are installed throughout the world—they're "lightning proof." ■ This is scientific and safe storage protection for the entire range of volatile products. Tubeseals can be installed on any of your tanks—new, old, riveted, or welded. You owe it to the future safety of your conservation facilities to investigate. Send for the Tubeseal Bulletin now—it could be important.

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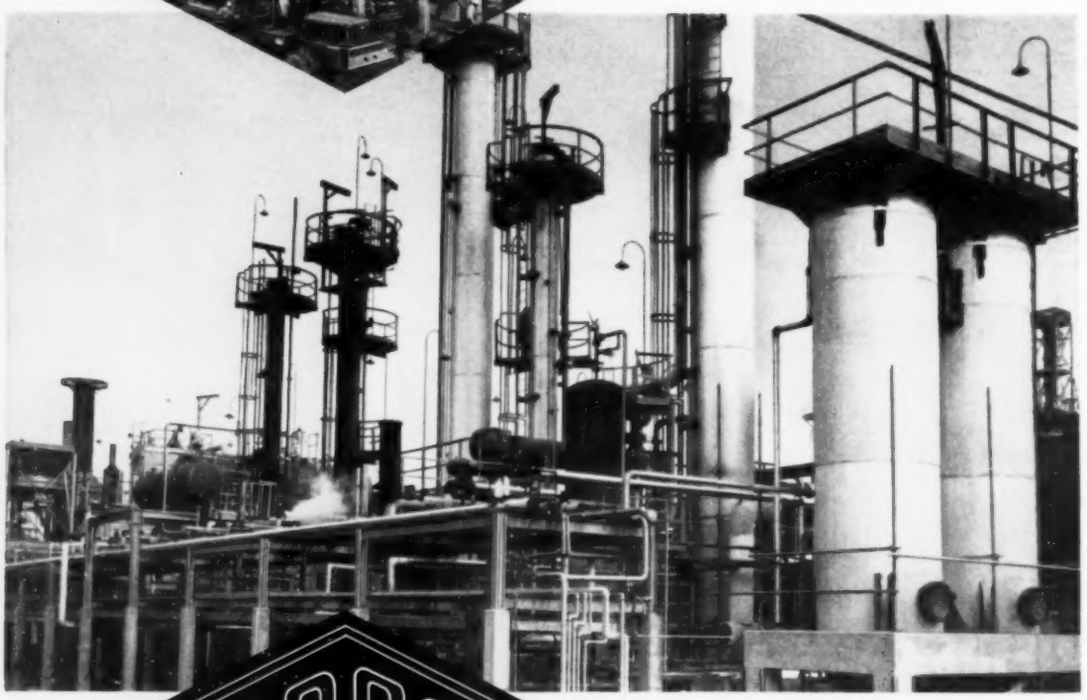
Procon-built Hydeal unit on-stream in 95 days!

Building a complicated process unit from the ground up requires the skillful coordination of a multitude of design, engineering, procurement and construction details.

It takes plenty of work, but most of all it takes time. Procon needed just 95 days from groundbreaking to on-stream acceptance of this Hydeal™ unit built for Signal Oil & Gas Company, in Houston, Texas. This highly efficient Hydeal unit produces 1,000 barrels-per-day of high quality benzene from a toluene charge. Signal markets the benzene direct to users in the Southwest.

New plant construction, expansion or modernization, whatever the requirement, you can trust the entire job . . . safely to PROCON.



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PETROLEUM REFINING AND PETROCHEMICAL PROCESSES . . . in all UOP offers 23 processes for the production of the full range of petroleum products.

MARKET RESEARCH SERVICE...includes evaluation of markets and potentials, geographic factors, marketing trends, personnel requirements, and process application planning.

FIELD SERVICE . . . UOP maintains an experienced staff of refinery experts located in strategic areas of the free world. These specialists are available to handle processing and allied problems encountered by refiners.

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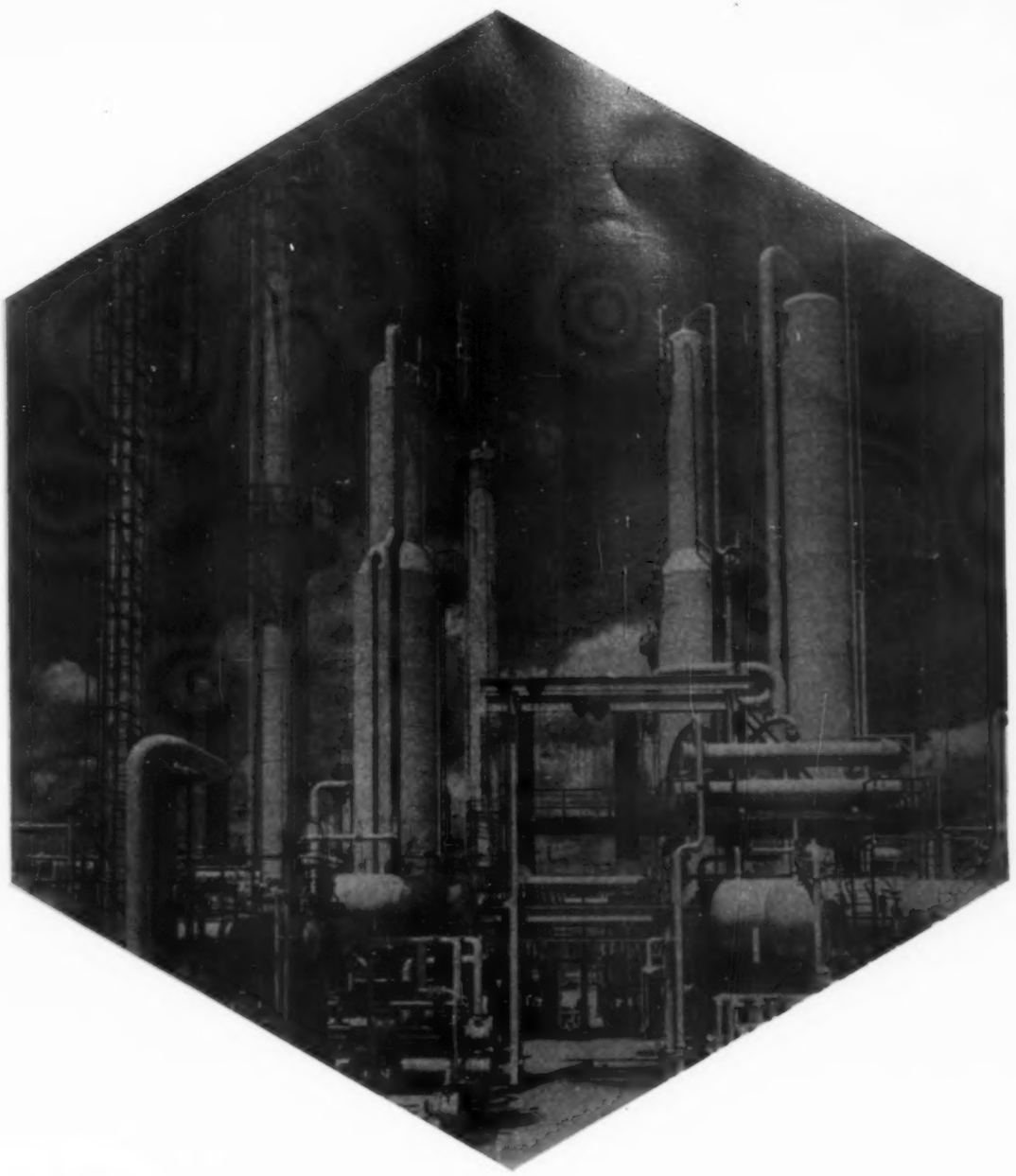

why UOP serves the petroleum industry so well

The fullest measure of service to the petroleum refining industry has been and will continue to be UOP's purpose. Starting with the research and design of petroleum refining and petrochemical processes, through the field and laboratory services performed in conjunction with these processes, UOP has directed its capacity to provide a wide variety of elements needed to aid the refiner in producing and marketing the best quality petroleum products.

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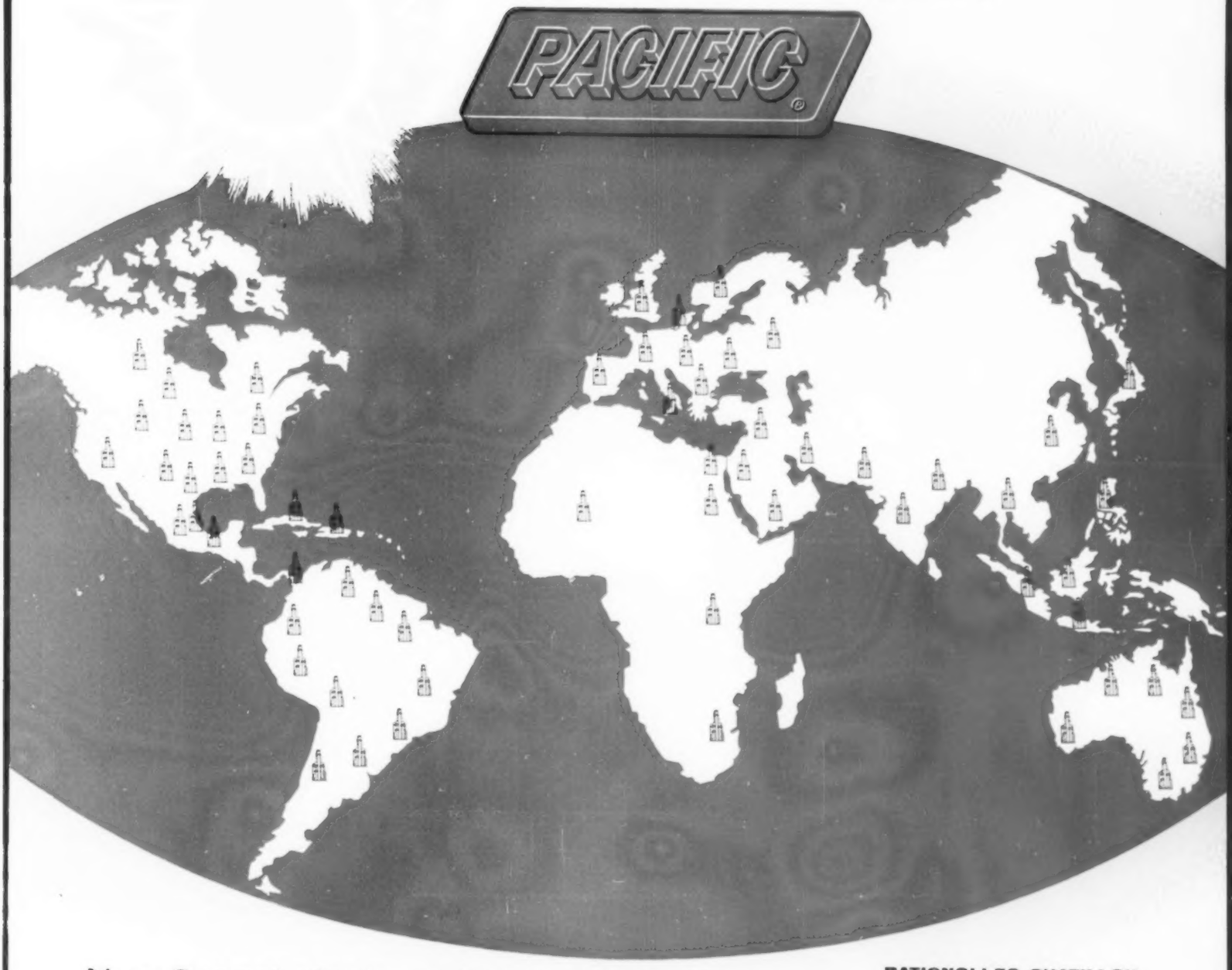

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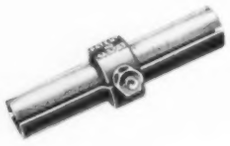

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A WORD OF CAUTION

Petroleum industry management men concerned with the profitable flow of their product to the customer—in essence the backbone of industry itself—are eternally alert for changes in external conditions which could have either adverse or favorable effects on their business. They are much like the ship's captain, whose course had to be changed from day to day—or even hour to hour—by information he obtained from the lookout on shifts in the wind or sea currents, storm signals, menacing icebergs or derelicts, or unexpected landfall.

The gravity of this responsibility is especially serious in times when the dynamic oil industry undergoes a number of rapid changes of such magnitude which could have deep and lasting effects on the charted course of many individual enterprises.

In this issue, the 31st annual international processing review of WORLD PETROLEUM, the reader will find a compilation of valuable information showing the present state of the world petroleum processing industry—how far it has come, where it is today, and where it appears to be going in the next few years.

The article immediately following this page summarizes the information on the world situation today in both refining and petrochemicals. It is based on the more detailed articles which follow—reviews of the industry in many important processing areas—as well as the 20-page survey of descriptions of each operating plant and all projects planned or now under construction throughout the world and outside the United States.

The editors are particularly proud to point out that this issue contains one of the first really comprehensive reports of activities in central and eastern Europe, including a most interesting account of facilities in the Communist bloc nations.

Considerable effort and space has again been devoted to petrochemicals as well as to conventional fuels and lubricants refining. The important role this field plays in the overall international petroleum processing industry is perhaps best emphasized in the fact that the total planned investment for new construction—some $10.5 billions—will be approximately equally divided between conventional refining and petrochemical manufacture.

A number of interesting and significant trends are brought out:

(1) Expansion in Western Europe, Australia, and Japan—the highly industrialized regions of the world—will continue at a strong growth rate and will be rising from already substantial levels.

(2) Expansion in Africa and parts of Asia—areas just beginning to become important industrially—will show spectacular growth in view of the fact they are rising from relatively low bases. In fact, in a number of countries new refineries or petrochemical complexes are starting where there had been virtually no petroleum processing industry at all before.

(3) Expansion in the Communist bloc nations will also be large. On a relative basis, these countries expect to have about 18% of the world's total crude refining capacity by 1965, compared with around 11.5% this year and 8.5% five years ago.

(4) Growth rates in the non-Communist world for the next five years will be about 4% annually; in the non-Communist world excluding the USA they will be about 7%; and in the USSR countries they will be almost 20% annually.

These shifts and changes in relative position are among the important points to keep in mind. Although the specific figures reported, and on which these trends are based, are the best and most accurate it is possible to obtain, they should not be regarded as absolutes. Anyone concerned with the management of an enterprise will recognize quickly that many factors can have an effect on the available data. Such factors as the human element and the political implications will doubtless always affect the data reported for public consumption by information gathering bureaus, whether they are in government or in the private domain.

In any event, managements whose responsibilities cover the sales and distribution of products—be they fuels, lubes, petrochemicals, or other specialties—will find it necessary to pay constantly increasing attention to the changes in the world's markets and the world's sources of supply. They will find it essential to watch carefully the way in which new manufacturing installations grow in both old and new areas, and the potential effects such supply sources will have on the buying by their customers.

World refining will increase 31% by 1965, to 32.3 million barrels daily

Largest share of growth continues in the Eastern Hemisphere. Announced refinery and petrochemical projects represent total investment of over $10.5 billion

by William C. Uhl
Processing Editor

A 31% RISE in the world's total refining capacity is forecast for 1965, from this year's 24.7 million barrels daily to 32.3 million barrels daily. This includes the USSR and other Communist countries, where capacity is to be doubled in this period.

The non-Communist world alone will increase 21.3%, from 21.87 million b/d in 1961 to 26.52 million b/d in 1965.

Similarly, in petrochemicals, construction now planned or under way will add 363 new processing plants, raising the number of operating units by 74%.

Overall, the international processing industry will spend more than $10.5 billion on new refining and petrochemical facilities during the coming few years. About $4.9 billion will go for new refining capacity and downstream processing, and $5.7 billion will be spent on petrochemical manufacturing installations.

The trends in refinery capacity growth for the ten-year period 1956-1965 are shown in Table 1. Predicted increases by geographical area for 1965 and estimated investment are shown in Table 2.

As in the past several years, construction in the Eastern Hemisphere continues to dominate the world growth picture. Expansion will be 3.4 million b/d (44.5%) between 1961 and 1965, compared with 1.2 million b/d (8.9%) in the Western Hemisphere. The west still has the greater share of free world capacity, but this will drop, from 65% this year to about 58% in 1965.

The expected rapid growth in capacity in the Soviet sphere—from 2,846,200 b/d to 5,794,100 b/d—will increase that group's share of the total world capacity considerably, raising it from 11.5% today to 18.1% in 1965. By that year, these countries will have a combined capacity almost as large as all of Western Europe.

A detailed breakdown, by individual nation, is given in Table 4, which includes present crude capacity and a forecast for 1965 as well as present capacities for the major downstream processes.

Substantial gains in capacity will occur in several countries. Japan plans to add 717,300 b/d (virtually doubling its 1961 capacity); Italy will add 601,700 b/d (70% increase); West Germany 381,500 b/d (48%); Australia, 126,800 (52%); France, 146,000 b/d (16.5%); the USSR and Bloc, 2,947,900 b/d (104%).

There are 25 countries in which the first refinery is to be built in the next few years, accounting for a total of 33 new plants and a new capacity of this type alone totalling 657,000 b/d. Twenty of these refineries, representing 444,000 b/d (68% of the total), will be in the Eastern Hemisphere, primarily in Africa. The remaining 13, representing 213,000 b/d (32%), are in the Western Hemisphere, primarily in Central America and the Caribbean areas.

Trends in downstream processes are not so clear-cut nor as simple to forecast numerically this year. In the recent past, the dominant growth has been in catalytic reforming, with catalytic cracking levelling off to a plateau.

There now appears to be a potential trend back to renewed emphasis on catalytic cracking and away from the so-called "standard" type of European refinery which consisted of a topping unit and a catalytic reformer.

The reason behind this seems to be the shift in European markets. Strong competition from natural gas and a surplus of fuel oil has been depressing the market for heavy fuel oil. As a result, refiners are giving serious consideration to methods of obtaining greater flexibility in their product mix. Catalytic cracking units will probably be the method they choose, and will likely be installed in many of the newer plants to be built as well as added to existing refineries not now equipped with such units.

Another significant factor has been the continued rise in European motor fuel octane ratings. Recent increases have brought the regular grade gasolines into the upper 80's, and premium to around 94.

In the field of petrochemicals, the Eastern Hemisphere also shows the greater amount of new projects: 184 versus 179 in the west (see Table 3). Investment, however, will be stronger in the Western Hemisphere, since there is still a healthy growth taking place in this industry in the USA.

As will be seen in Table 3, it is not possible to develop precise data on investments. Although virtually all companies make known the major products and the locations of their existing and planned new facilities, only about one-third of the announcements on new projects include information on output volumes or on planned expenditures.

There are now about 629 operating petro-

(Continued on page 104)

TABLE 1—World Trends in Refining Capacity
(in million barrels daily)

Year	USA	Outside USA*	Free World	USSR & Bloc	World Total
1956	8.63	7.94	16.57	1.54	18.11
1957	8.92	8.51	17.43	1.80	19.23
1958	9.19	9.93	19.02	1.95	20.97
1959	9.80	10.08	19.88	2.40	22.28
1960	9.85	11.04	20.89	2.40	23.29
1961	9.93	11.94	21.87	2.85	24.72
1963	10.15	13.84	24.34	3.96	28.30
1965	10.54	15.98	26.52	5.79	32.31

*Excluding USSR & bloc.

TABLE 2—World Refining Expansion, 1961-1965

Area	Crude capacity in 1,000 b/d 1961	1965	Percent Increase	Estimated investment $ millions
North America	11,257.9	12,078.0	7.3	850
South America	2,919.9	3,346.6	14.5	450
Western Hemisphere	14,177.8	15,424.6	8.9	1,300
Western Europe	4,629.6	6,242.2	35.0	1,800
Africa	130.5	540.5	315.0	400
Middle East	1,394.7	1,583.9	13.5	200
Asia & Far East	1,526.8	2,721.0	78.0	1,200
Eastern Hemisphere	7,681.6	11,087.6	44.5	3,600
Free World Total	21,859.4	26,512.2	21.3	4,900
USSR and Bloc	2,846.2	5,794.1	104.0	
World Total	24,705.6	32,306.3	30.8	

TABLE 4—WORLD PETROLEUM REFINERIES

Crude and major processing capacities as of June 15, 1961, with crude estimates for 1965

(Figures in thousand barrels daily)

Country	No. of Plants 1961	No. of Plants 1965	Crude capacity 1961	Crude capacity 1965	Vacuum Dist.	Thermal	Catalytic Cracking	Catalytic Reform	Hydrogen Process.
Canada	43	47	959.2	1,033.0	366.0	147.6	299.7	167.1	215.1
Mexico	6	7	365.0	503.0	136.0	46.5	78.0	19.5	58.0
USA	298	300	9,933.7	10,540.0	3,476.0	1,903.6	3,656.9	1,963.2	2,219.6
North America	347	354	11,257.9	12,078.0	3,977.9	2,097.1	4,034.6	2,149.8	2,492.6
Barbados	1	1	1.2	1.2					
Costa Rica	0	2	0	10.0					
Cuba	8	9	86.6	104.6	22.1	0.6	14.6	11.2	6.5
Dom. Repub.	0	1	0	11.0					
Guatemala	0	3	0	26.0				1.2	2.6
Honduras	0	1	0	15.0					
Jamaica	0	1	0	26.0					
Netherlands Antilles	2	2	650.0	650.0	19.2	418.0	80.0		
Nicaragua	0	1	0	10.0					
Panama	0	2	0	90.0					
Puerto Rico	2	2	90.0	90.0	58.7	20.0	62.1	7.5	10.0
El Salvador	0	1	0	15.0					
Trinidad	3	3	292.0	292.0	60.0	25.0	28.0	24.0	28.5
Central America & Caribbean	16	29	1,119.8	1,340.8	160.0	463.6	184.7	43.9	47.6
Argentina	18	19	321.7	425.0	16.2	99.6	32.0		
Bolivia	4	4	11.9	11.9					
Brazil	9	10	300.4	330.5	20.5	31.0	49.0	11.0	
Chile	3	3	47.2	47.2		14.0	12.0	6.0	6.0
Colombia	5	5	71.4	80.0	18.0	16.5	28.1		
Ecuador	3	3	16.0	24.0	0.3	6.6			
Paraguay	0	1	0	10.0		14.5			
Peru	3	5	47.6	94.2					
Uruguay	1	1	46.0	46.0		2.2	5.0	3.0	
Venezuela	11	11	937.0	937.0	99.0	105.2	43.7	27.7	17.0
So. America	57	62	1,799.2	2,005.8	154.0	289.6	169.8	47.7	23.0
Austria	6	6	46.5	64.5	2.2	5.2	N.A.	5.0	5.0
Belgium	6	6	163.3	213.3	20.0	13.4	26.1	20.5	20.7
Denmark	1	4	0.6	75.6					
Finland	1	1	24.0	48.0	12.0		8.3	3.4	
France	15	19	881.3	1,027.3	22.4	100.0	105.5	101.8	52.5
Germany (West)	25	34	796.3	1,177.8	47.6	31.3	74.7	104.0	106.9
Greece	2	2	40.0	40.0	2.4			8.0	
Ireland	1	1	41.7	41.7				9.0	6.1
Italy	34	42	861.6	1,463.3	32.0	83.0	45.8	85.0	70.0
Netherlands	3	3	459.0	459.0	36.0	46.5	77.0	38.2	33.8
Norway	1	1	40.0	40.0				6.0	
Portugal	1	2	29.0	50.0			11.0		
Spain	2	5	146.5	283.0	2.5	11.5		16.0	
Sweden	5	5	63.6	64.8	8.3	5.9		11.8	7.2
Switzerland	0	1	0	40.0					
United Kingdom	16	18	997.3	1,058.3	94.2	54.9	125.4	90.8	85.1
Yugoslavia	3	5	38.9	95.6	3.6	2.4	2.0		
Western Europe	122	155	4,629.6	6,242.2	283.2	354.1	475.8	499.5	387.3
Algeria	0	2	0	54.0					
Angola	0	1	0	3.0					
Egypt	3	3	86.0	144.0	7.7	12.8		0.8	5.6
Ghana	0	1	0	24.0					
Kenya	0	1	0	36.0					
Libya	0	1	0	4.0					
Morocco	1	2	5.0	30.0			3.5		
Mozambique	1	1	12.0	12.				2.5	2.0
Nigeria	0	1	0	20.0					
Rhodesia	0	1	0	14.0					
Senegal	0	1	0	40.0					
South Africa	2	4	27.5	119.5	2.0	3.1	10.0	5.0	6.0
Sudan	0	2	0	20.0					
Tunisia	0	1	0	20.0					
Africa	7	22	130.5	540.5	9.7	15.9	13.5	8.3	13.6
Aden	1	1	120.0	136.0				12.0	3.5
Bahrain	1	1	186.5	186.5	34.0	28.0	27.3	10.5	10.5
Iran	4	4	437.6	437.6	74.0	81.0	35.0		
Iraq	6	7	78.9	110.8		16.7			
Israel	1	1	75.0	75.0	4.1	15.7			
Jordan	1	1	6.6	6.6			1.2	0.8	
Kuwait	1	1	171.0	171.0				3.8	
Lebanon	2	2	22.5	22.5				4.3	
Neutral Zone	2	2	80.0	80.0					
Qatar	1	1	0.6	2.4					
Saudi Arabia	1	2	189.0	209.0		25.0		14.0	15.0
Syria	1	1	20.0	20.0					
Turkey	1	5	7.0	126.5	2.0		3.0		
Middle East	23	29	1,394.7	1,583.9	114.1	166.4	66.5	45.4	29.0
Australia	7	10	244.0	370.8	65.7	9.5	77.0	42.9	36.5
Br. Borneo	1	1	46.0	46.0					
Burma	3	3	11.6	16.3		1.7			
Ceylon	0	1	0	22.0					
India	4	7	117.0	207.0	2.6	5.7	28.3	6.7	
Indonesia	6	6	273.8	273.8	12.0	59.0	10.0		
Japan	25	36	721.4	1,438.1	142.8	14.4	47.2	49.9	32.9
Korea (So.)	0	2	0	35.0					
Malaya	0	2	0	40.0					
New Zealand	0	1	0	50.0					
Pakistan	1	2	5.0	37.0					
Phillipines	2	4	47.0	82.0	9.2		11.9	3.4	14.3
Singapore	1	2	20.0	40.0					
Taiwan	1	1	35.0	35.0	12.0	4.5	10.0	3.1	5.5
Thailand	2	2	6.0	6.0			2.0		
Vietnam	0	1	0	22.0					
Asia and Far East	53	81	1,526.8	2,721.0	244.3	94.8	186.4	106.0	89.2
West. Hemisphere	420	445	14,177.8	15,424.6	4,291.9	2,850.3	4,389.1	2,241.4	2,563.2
East. Hemisphere	205	287	7,681.6	11,087.6	651.3	631.2	742.2	659.2	519.1
Free World	625	732	21,859.4	26,512.2	4,943.2	3,481.5	5,131.3	2,900.6	3,082.3
USSR & Bloc	100-120	N.A.	2,846.2	5,794.1					
Total World			24,705.6	32,306.3					

Aerial view of Esso Petroleum's Milford Haven refinery, showing location of proposed new nitrogen facilities nearby

UK process projects emphasize petrochemicals

by Cecil W. Wood
European Editor

NOTHING HAS BEEN published this year to suggest any change in UK refining capacity from the end-1960 figure given in Petroleum Information Bureau's latest memo on "The United Kingdom Petroleum Refining Industry". This gives a total of 49,450,000 metric tons, say 989,000 b/d Recalling that the 1947 figure was only 2.5 million tons, PIB terms this rise "one of the outstanding economic features of the post-war period"—an expansion which is estimated to have cost well over £300 million, and leading to an industry whose exports of refined oils were valued at over £100 million last year, a valuable offset to the expenditure on imports.

TABLE 1—UK Production of Petroleum Products ex Imported and Indigenous Crude and Process Oils (incl. shale)

(1,000 long ton/yr)

	1960		1959	
	Volume	Percent	Volume	Percent
Motor & aviation spirit	7,917	17.8	7,531	19.2
Industrial & white spirit	167	0.4	141	0.3
Kerosine	2,284	5.1	1,773	4.5
Lubricating oil	912	2.1	863	2.2
Gas/diesel oil	7,648	17.2	7,241	18.5
Fuel oil*	21,822	49.1	18,631	47.7
Bitumen	1,037	2.3	961	2.5
Paraffin wax, scale and slack wax	36	0.1	31	0.1
Propane and butane	154	0.3	126	0.3
Misc. products & loss	2,488	5.6	1,838	4.7
Totals	44,465	100.0	39,136	100.0

* Includes refinery fuel consumption (from own production): 1960—3,290; 1959—3,032.

Details on current processing facilities in British refineries are given in the regular listings elsewhere in this issue.

Esso Petroleum's Fawley operations remain the largest, with its 230,000 b/d of crude running capacity. British Petroleum's Kent refinery is second in size, at 180,000 b/d; and Shell at Shell Haven, with 160,000 b/d, is third largest.

Petroleum products in 1960 totalled 44,465,240 long tons, a rise of 5,329,003 tons (13.6%) over 1959. This compares with a rise of 6,202,909 tons (18.8%) in 1959 over 1958. Details of output are given in Table 1.

A very large proportion of the "miscellaneous products and loss" was represented by chemical feedstocks, some 63% in 1960 against 53% in 1959.

No major change in UK refinery capacity is to be expected until next year. Late in 1962, Imperial Chemical Industries' new grass-root 1 million ton/yr crude distillation plant on the River Tees should be on stream at a cost of "several million pounds", and linked in with the Billingham-Wilton pipeline.

British Petroleum's new £8 million, 1.3 million ton/yr refinery in Northern Ireland is not due to be operating until late 1963. With the company's new Angle Bay (Milford Haven) ocean terminal in operation with 5 million ton/yr pipeline capacity to Llandarcy refinery, expectations have been expressed of an increase in the 3 million ton/yr capacity of this plant, especially in view of Baglan Bay petrochemical developments.

ICI's entry into crude oil processing for the first time represents a vertical integration of its petroleum-chemical producing operations of particular importance. Instead of purchasing all the naphtha from Shell-Mex and B.P. for the Wilton olefin plants, as in the past, crude will be purchased instead, processed primarily for naphtha, and the other products sold to SM & BP for marketing. The new distillation unit will provide about half the feedstock needed for Wilton.

The other major current refinery project more strictly concerns chemicals from petroleum. Esso Petroleum's £5.5 million second steam cracker at Fawley, with ethylene and butadiene extraction plant being

TABLE 2—Capital Investment in UK Petroleum Chemical Industry

From 1953 to end of	$ millions	Index
1957	212	100
1958	265	125
1959	347	164
1962	553	261

Source: OEEC Chemical Products Committee Reports.

built to supply 40,000 ton/yr of ethylene to ICI's new Severnside Works by a 70-mile Esso pipeline, also due for completion by the end of this year. This unit will more than double Fawley's ethylene capacity and will be completed by the end of this year. Fawley's turbo-jet production facilities are also being expanded.

The other developments are: (1) a 15,000 b/d crude topping unit being built by Kellogg International at Mobil Oil's Coryton refinery, designed for ready expansion and due on stream early 1962; (2) a 5,000 b/d atmospheric/vacuum distillation plant at Lobitos Oilfields' Ellesmere Port refinery due on stream this year to replace existing plant; (3) at British Petroleum's Kent refinery a third catalytic reformer is building, with 23,000 b/d capacity; and (4) Shell Refining Co. has plants under construction at Stanlow for the manufacture of paraffin waxes, and at Shell-Haven for recovering isopentane for upgrading gasoline quality.

Detailed figures on capital expenditure are only published officially after a two year interval. The 1959 figure is believed to have fallen to £21.7 million, comparing with £39.9 million in 1958 and the peak of £42.1 million in 1957. Thus, the total spent since 1948 (the earliest figure available) on plant, machinery and vehicle acquisitions, new building, and civil engineering works (excluding site value) up to 1959 will have been £275 million. Including 1960, it is likely to have reached £300 million.

Chemicals from Petroleum

In 1959 coal and petroleum are estimated to have been approximately equal in importance as the supplier of carbon for organic chemical synthesis in the UK, and about 50% of basic organics were made from oil.

This statement is made in "The Chemical Industry of Europe 1959-60", published recently by the Chemical Products Committee of OEEC.

Capital investment in this industry has risen by $82 million in the UK, to a total of $347 million, from 1953 to end-1959. On the basis of projects known at the time of the report, these plans will call for the investment of a further $206 million, bringing the total investment from 1953 to end 1962 to $553 million. See Table 2. The growth in volume in terms of carbon content is given in Table 3.

Much valuable factual information and statistical data was presented in a paper last February at the New Orleans meeting of the American Institute of Chemical Engineers by Harold P. Hodge, manager of market research and development of Esso Petroleum Co.'s chemical division in London.

Three tables are reproduced in part from this paper—Tables 4, 5, and 6. The production data on organics refers to actual tonnage figures, and not carbon content as in OEEC reports.

Mr. Hodge characterized the industry as showing "the most dynamic growth rates any major manufacturing industry in Britain". He states that against an annual growth rate for organic chemicals as a whole over the period from 1949 to 1959 of 11%, that of plastics was 15% and of chemicals from petroleum 37%. Further, petroleum's share as a raw material for organic chemical production has risen from 9% in 1949 to 47% in 1959, and he forecasts a rise to about 65% by 1962. In terms of capital investment, Hodge puts the total from 1953 to end-1960 at $395 million.

The Petroleum Industry Advisory Committee's "U.K. Petroleum Industry Statistics relating to Consumption and Refinery Production" reports 1960 deliveries into inland consumption of "chemical feedstock" at 1,562,060 long tons, a rise of 494,795 tons or 46.4% over 1959.

While admitting that precise figures are not available, Petroleum Information Bureau estimates the 1960 value of petrochemical exports at £30 million, excluding the petrochemical content of many finished products (such as detergents).

In direct support, the following 1960 export figures may be quoted: synthetic organic detergents and soap substitutes, £6,482,460 (47,265 tons); synthetic rubber, £4,726,341 (31,644 tons); and carbon blacks other than animal blacks, £4,256,939 (58,972 tons).

Current Projects

This review will make only brief reference to news of major projects published since the last half-yearly survey (WORLD PETROLEUM, January 1961). The most interesting concerns the light thrown on plans for two new manufacturing centers—Milford Haven and Baglan Bay.

Milford Haven — Fisons Ltd., Britain's largest producer of chemical fertilizers, is forming a 50:50 company with Esso

(*Continued on page 108*)

TABLE 3—UK Output of Organic Chemicals from Petroleum

(in 1,000 metric ton/yr of carbon content)

Year	Volume	Index	% over prev. yr.
1953	108	100	—
1954	162	133	32
1955	195	160	21
1956	220	176	10
1957	274	225	25
1958	302	248	10
1959	385	356	27
1960	482	446	25
1962	952	881	98*

* A two-year increase.
Source: OEEC Chemical Products Committee Reports. 1960 and 1962 estimated.

TABLE 4—Sources of UK Organic Chemical Production

(1,000 metric tons and percent)

Source	1962	1959	1955
Petroleum	1,400 (63%)	595 (47%)	290 (32%)
Coal tar	540 (25%)	365 (29%)	275 (31%)
Acetylene	150 (7%)	135 (11%)	110 (12%)
Synthesis gas	90 (4%)	95 (7%)	80 (9%)
Fermentation	30 (1%)	80 (6%)	140 (16%)
Totals	2,210	1,270	895

Source: "The Heavy Organic Chemicals Industry in the U.K." H. P. Hodge.

TABLE 5—UK Production of Chemicals from Petroleum, and Feedstock Used

(in 1,000 metric tons)

Year	Production Organic	Production Inorganic*	Petroleum Feedstock
1955	290	90	900
1956	330	110	970
1957	435	130	1,280
1958	475	160	1,490
1959	595	245	1,850
1960 est	750	295	2,350
1962 est	1,400	300	4,290

* Carbon black, ammonia, and sulfur.
Source: as for Table 4.

Driving the first pile at the site of BP California Ltd.'s new aromatics plant at Kent

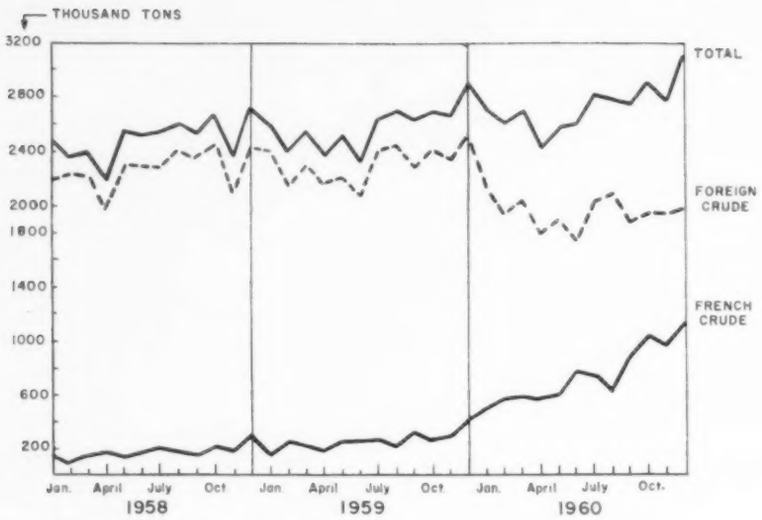


Fig. 1—Monthly changes in origin of crude run to French refineries, 1958-1960.

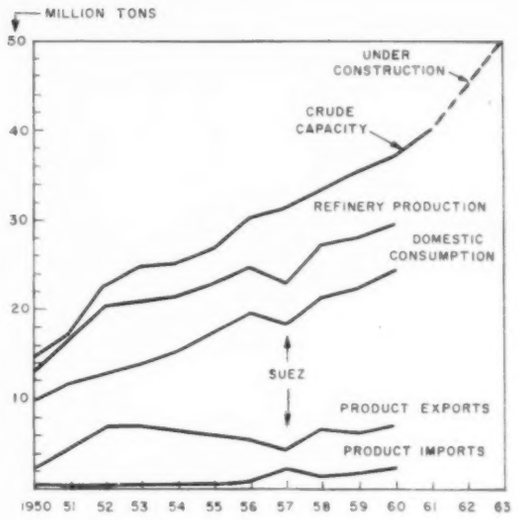


Fig. 2—Trends in France's refining, consumption, exports and imports.

France's refining capacity will increase 25% by 1963

by Jacques C. Lamasse

Petrochemical growth is also very rapid. French capital raises its share of ownership in processing facilities

THE FRENCH PETROLEUM INDUSTRY is in the middle of a number of significant shifts and changes:

(1) Refining capacity will rise some 25% by 1963—to over 50 million ton/yr, on the basis of current expansion plans alone.

(2) Traditionally an importer of crude oil, the nation will become an exporter by 1965.

(3) French capital is increasing its share of ownership in the country's refining in relation to Dollar and Sterling owners.

(4) Petrochemicals are expanding at an extremely rapid rate. Total investment has risen $206 million since 1959, reaching $309 million at the start of this year.

France's 14 major operating refineries had a total crude capacity of 40,240,000 ton/yr on January 1, 1961. Capacity has risen steadily for several years: it was 33.5 million in 1958; 35.5 in 1959, and 37.4 in 1960. The increase forecast for 1963 will come through anticipated expansion in existing plants as well as the following new facilities:

(1) Raffinerie de Strasbourg (CFR-CFP 33.3%, Antar 33.3%, BP 33.3%), a 3.3 million ton/yr refinery at Strasbourg.

(2) Cie. Rhenane de Raffinage (Shell et St. Gobain 85%, UIP 10%, Mobil 5%), 3.5 million ton/yr refinery at Strasbourg.

(3) Raffinerie d'Alger (CFP-CFR 32%, SN Repal 10%, Beryl 6%, Shell 18%, Esso 17.6%, BP 10.4%, Mobil 6%); a 2.5 million ton/yr refinery at Algiers.

(4) Cie. de Raffinage en Afrique Nord (Financiere et Industrielle des Petroles 90%); a 200,000 ton/yr refinery at Hassi Messaoud.

(5) Esso Standard; a refinery of undisclosed size at Marseille, to be designed especially for Sahara crude oil.

From a complete dependence on Sterling and Dollar areas for its supply of crude, France has become a significant crude producer by the attainment of commercial production in the Hassi-Messaoud, Edjele, Zaraitine, and continental France fields. See Table 1 and Fig. 1.

In forthcoming years, the proportion of France zone petroleum should rise still more. Recoverable reserves have been estimated at more than 600 million tons, and crude production has been forecast as follows (in million ton/yr):

Source	1961	1963	1965
France	2.3	3	4
Sahara	20—21.5	24—32	24.5—48
Gabon	1.3	1.1	1.2
Totals	23.6—25.1	28.1—36.1	29.7—53.2

Thus, even in the least optimistic case, France will become an exporter starting in 1965. At that point, national production of about 30 million ton/yr, in addition to CFP's Middle East production, would exceed the estimated needs of 46 million ton/yr by 10%.

This shift in the oil industry's orientation —barring an unforeseen evolution of economic or even political factors—means changes will be made to meet the need to refine and sell Sahara crude oil.

For example in the technical side, it means revamping process equipment to handle lighter crude. Commercially, there has been the birth of a second "nationalized" French company: Union Industrielle des Petroles (UIP); formed by African and continental French producers of Franc zone oil (60%), and Caltex (40%), with its refining, transportation and distribution activities.

TABLE 1—Percentage of Crude Runs in France by Source

Source	1955	1959	1960	Jan. 1961
Middle East	90.78	81.13	63.82	59.86
USA	0.25	0.25	0.19	0.27
Venezuela	4.75	7.77	7.15	4.46
Italy	—	0.64	0.15	—
USSR	0.69	0.41	0.41	0.39
Franc zone	3.53	9.80	8.28	35.02

TABLE 2—Petroleum Raw Materials for Petrochemicals

Conventional	1959	1960
Ethylene	—	31,444
Propylene	36,765	45,159
Butylene	20,471	34,288
Butylene dimers	4,347	3,579
Propylene trimers	5,690	7,943
Propylene tetramers	27,989	22,828
Butadiene	—	4,259
Aromatics (B-T-X)	48,886	55,915
Aromatic distillates and solvent naptha	9,992	15,100
Heavy distillate	69,311	101,570
Heavy gas oil & fuel	70,769	96,282
Others	2,571	850
Sub-totals	296,791	419,217
Nitrogen products:		
Natural gas	145,000	205,339
Refinery gas	57,491	56,886
Light distillate	522	485
Heavy fuel	16,200	5,655
Crude oil	—	877
Sub-totals	219,213	269,242
Sulfur:		
Hydrogen sulfide	17,745	18,511
Sulfur	430,724	794,242
Sub-totals	448,469	812,753
Grand totals	964,473	1,501,212

Total capital invested in refineries on January 1, 1961, was 1,613 million NF (new Francs), distributed as follows: 40% of French origin (CFR, ANTAR, and UIP) and 60% of foreign origin—28% from the Sterling zone (Shell and BP) and 32% from the Dollar zone (Esso and Mobil). About the same proportions were found in refining capacity—41% French and 59% foreign. This was a considerable change since the end of 1959, when Francs, Dollars and Pounds Sterling each had approximately an equal share of the total invested capital.

This growth in French interest is due, among other things, to the purchase by UIP of the Caltex refining interests, and by the increase in capacity, 83%, at the CFR Gonfreville refinery.

There has been a marked contrast in the growth rates of French refining capacity and petroleum consumption, as shown in Fig. 2. The impetus has not been due alone to growth in demand for conventional products. Rather, it is also because of a large rise in use of hydrocarbons in petrochemicals. As shown in Table 2, total requirements were 1.5 million long tons in 1960 and 0.96 long tons in 1959. By comparison, the 1958 total was 371,638 tons; thus a 400% increase in two years.

The rise in petrochemical production (in carbon content) and investment since 1953 is given in Table 3. The average expansion rate between 1953 and 1959 in France has been more than 16.2, compared to about 6 for the OEEC countries.

Currently, it is estimated that 50% of the raw material for France's organic chemical industry comes from hydrocarbons. See Table 4. It is primarily the petroleum and natural gas materials which have risen. Consequently, in 1961, petrochemicals will cover about 70% of the requirements of the organic chemical industry and 60% of the needs of the entire chemical industry.

TABLE 3—Growth in French Petrochemical Industry
(Production in 1,000 ton of carbon content; Investment in $ millions at end of year)

Year	Production	Total Investment
1953	16	33
1954	28	46
1955	37	47
1956	50	50
1957	80	69
1958	118	84
1959	260	290
1960	n.a.	309
1961 est	510	n.a.

There are now more than 80 different companies located in eight large petrochemical complexes, seven of them in France and in full operation. The implementation of the eighth complex, in Algeria, to process Sahara natural gas, depends on governmental decisions relating to the expansion of the industrial center at Oran.

For the most part, the petrochemical firms are specialized subsidiaries of powerful groups of oil and chemical companies who have pooled their financial and technical resources. Sometimes the petroleum firms participate, with long-term contracts, in supplying basic materials. Certain foreign participation consists mainly in supply of licenses and processes.

The great expansion in refining and petrochemicals in France has been motivated by the need to attain and maintain a commercial balance. It is already estimated that in organic chemicals alone, the country's 1956 deficit of 256 million NF must be replaced in 1961 by an excess of 234 million NF. This, added to the fact that such industries as textile, packing, etc, can now use these chemical materials as "substitutes," will yield a saving in foreign currency of the order of 1 billion NF per year.

This spectacular growth has been possible only through an extremely important financial effort: 100 NF per ton per year of crude oil processed, and 2,000 to 2,500 NF per ton per year of petroleum carbon used in petrochemicals. The effort is well justified by the value of the products: about 25 NF per ton of processed crude, and 1,000 to 4,000 NF per ton of carbon content in petrochemicals.

It has been accomplished in a large part by self-financing by oil and chemical groups. Bank credit participation remains limited, and government investment is low.

We have, therefore, an operation sponsored by private capital with an international character, which highlights the small role played by the French producer group, UIP; and the important part played by foreign groups—American, British, German, and Italian.

The inspiration behind this effort has been the discovery in the past decade of new sources of energy—natural gas at Lacq and Hassi R'Mel, and oil in the Sahara.

Whatever the ultimate destiny of Saharan hydrocarbons, a new situation has been created, one that is irreversible unless a severe international crisis arises. First, France now has a petroleum and petrochemical industry which will put her among the exporting countries of the world. Secondly, a large segment of French industry—particularly in the gas chemical and metallurgical fields—is beginning to convert to direct utilization of natural gas.

Other nations face a somwhat similar situation — western Germany and Italy (our most important partners in the Common Market), Great Britain, Japan, and the USA, as well as countries which up to now had been importers and are starting to build.

The need to assure an international financial balance will force many nations to seek outside markets. In this new outlook, the selling price—based on the cost of energy and raw materials—will become the only objective sales point to the buyers in the as yet free markets, or those left "free" by the departure of their traditional monopolists.

The sad outlook of these struggles is already provoking some "anguished" changes. Great Britain—to keep its industry competitive—will import liquid methane in spite of considerable opposition by its nationalized coal industry, its Labor Party, and its powerful Federation of Miners.

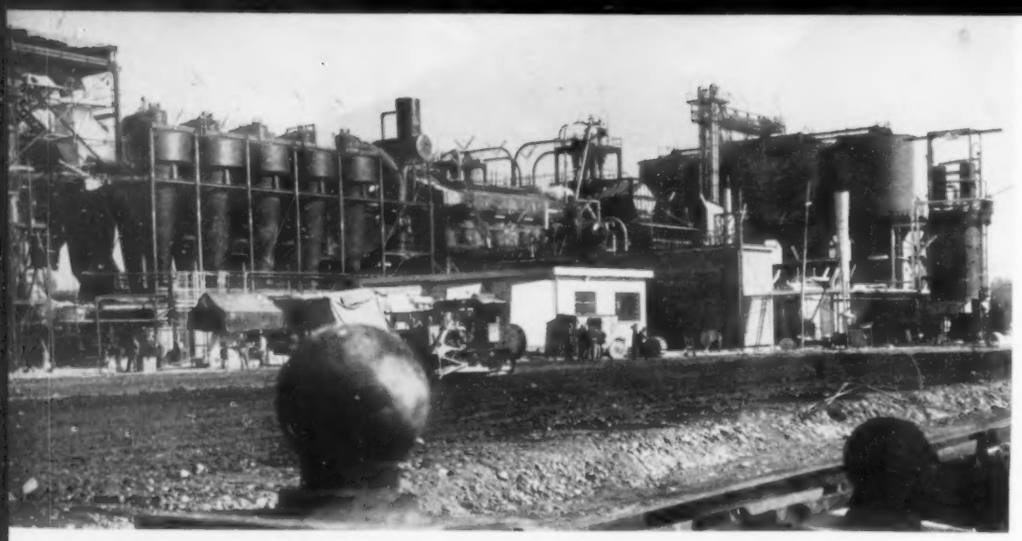
What will happen that day in 1963, when the pipeline from the Soviet area reaches Austria and Bavaria to start delivering Russian oil and gas at the frontier of the Western World? END

Meet the Author

Jacques C. Lamasse, associated since January, 1960, with the French journal, *Petrole Informations*, has long been a specialist in studies of petroleum economics, and has written numerous articles on petrochemicals, refining, natural gas, and underwater pipelines. A graduate in social and political sciences as well as Slavic languages, he was previously a journalist with the Havas Agency in central Europe and the Far East.

TABLE 4—Source of Raw Materials for French Organic Chemicals, 1959

Basic Products	1000 tons	Percentage from: Coal	Oil & Gas	Others
Methane	8.4	—	96	4
Propane	2.5	—	100	—
Acetylene	72.7	—	—	100
Ethylene	48.9	38	57	5
Propylene	89.0	2	98	—
Butylene	26.6	—	100	—
Butadiene	0.5	—	85	15
C_4 aliphatics	21.0	—	100	—
Benzene	131.0	77	5	18
Toluene	7.0	51	49	—



Columbian-Continental Europa carbon black plant at Trecate. Collecting system and storage tanks during erection.

Italian refining continues climb

by Alberto Girelli*

ITALY'S ECONOMIC DEVELOPMENT has been very remarkable in 1960, mainly due to the strong investments in industrial enterprises starting in 1955. Although agriculture showed a decrease of 4% over 1959, industry had a good year. Industrial production was up 15.2% and commerce and services up 11.9%. Overall national income increased 6.8%. Consumption went up 6.3%, and investment 18.2% (both in "real" terms).

The favorable economic development has also been felt by petroleum, particularly internal product consumption and petrochemical expansion. Tables 1, 2, 3, and 4 give official figures on Italian petroleum activities: crude runs to stills and the product distributions, internal consumption, imports and exports, and geographic distribution of exports.

The picture of the refining industry—however—is not as bright as could be inferred from the figures reported. Price decline of some of the most important products (especially of gasoline), overexpansion of crude capacity, and some difficulties in international trade, have been major headaches for Italian refiners. Domestic crude production in 1960 was 1,950,000 tons, a 15% increase over 1959. Production of natural gas was 6.2 billion cubic meters.

For the greatest part, crude processed in Italian refineries has been imported, mainly from the Middle East (85.2%), traditional for Italy. A larger share of imports has been taken by Soviet oil (13.1%), and a small amount (1.7%) from Venezuela. Percentage distribution of crude from the Middle East was: Kuwait, 31.4%; Saudi Arabia, 20.6%; Iraq, 27.6%; Iran, 4.7%; and Egypt 0.9%.

The first tanker with crude oil from the "SIRIP" (ENI-NIOC) oilfield at Bahrgan Sar (offshore the Persian Gulf) landed at Bari March 19, 1961. Present production at Bahrgan Sar is 600 ton/d. In 1961, 300,000 tons of this crude (6,000 b/d) will be produced, to be increased to 800,000 by 1963, (16,000 b/d). The 33° API crude, with 1.8% sulfur, is very similar to the well known Gach Saran crude exploited by the International Consortium.

As in 1959, Italy leads western countries importing Soviet Oil, the world over; with almost 5 million tons, which includes 1.25 million tons temporarily imported for processing and export of products obtained. After the recently stipulated agreement, Italian oil imports from the Communist area will be expanded in the near future. A commercial treaty signed in Moscow calls for the import of 1.7 million tons crude in 1961, 1.8 in 1962 and 1.9 in 1963. In each year 110,000 tons gasoline, 275,000 tons gas and oil and diesel oil, and 425,000 tons fuel oils will also be imported from the USSR.

Italian local consumption in 1960 marked a new record: 18 million tons, a significant increase of 24% over 1959. The greatest increase, in tonnage and percentage, was in fuel oil (10.8 millions tons, up 27%). This remains by far the product in strongest demand. For the first year, a very interesting increase has been marked by gasoline (+25%).

The constant expansion of Italian car circulation in number and in quality—favored also by a highway construction program and by the decrease of retail price—played a major role in increasing gasoline consumption.

Italian Automobile Production

	Cars	Trucks	Total
1956	279,900	35,893	315,793
1957	318,775	33,024	351,799
1958	369,374	34,174	403,548
1959	470,659	30,118	500,769
1960	595,907	48,710	644,617

Refinery construction and expansion: While a few of the more ambitious new construction programs seem to be abandoned (Esso has dropped the plan of erecting a 4 million ton/yr refinery near Pavia, the Purfina—ENI project for a large refinery near Rome seems to have been abandoned), other programs, mainly of expansion of existing facilities, are well under way.

The new refinery of "Mediterranea Petroli" (B.P. group) at Milazzo, Sicily, will be ready by October 1961. It is a 2.5

*Dr. Girelli is Editor, *La Chimica e l'Industria*, Milan, Italy.

TABLE 1—Crude run and products distribution, 1959 and 1960
(Metric Tons)

	1959	1960	% Diff.
Gasoline	3,645,983	4,399,310	+19.5
Kerosine	446,667	531,741	+19.1
Jet fuel	580,748	529,281	— 8.9
Gas oil	5,189,457	5,994,253	+14.5
Fuel Oil	13,133,734	15,346,068	+16.9
Lubricant	153,378	165,792	+ 8.1
White oils, paraffin, wax, etc.	23,751	23,563	— 0.9
Virgin naphtha for chemical use	323,898	627,276	+93.7
Asphalt	631,853	697,110	+10.3
L.P. Gas	536,095	625,345	+16.6
Total Products	24,767,413	28,985,500	+17.0
Loss	510,703	582,281	+14.0
Refinery consumption	1,084,580	1,233,085	+13.7
Crude run, total	26,362,696	30,800,866	+16.8

Source: "Ufficio Petroli" Rome.

TABLE 2—Italian Consumption of Petroleum Products
(in 1,000 metric tons)

	1959	1960
Gasoline	2,025	2,535
Kerosine	158	167
Jet fuel	200	185
Gas oil & Diesel fuel	2,352	2,735
Fuel oil	8,600	10,800
Lubricants	186	222
White oils, wax, etc.	50	55
Asphalt	545	615
LP Gas	600	700
Virgin naphtha for petrochemicals	250	367

Sicedison plant at Porto Marghera, near Venice, showing nitric acid absorption towers

TABLE 3—Italy's International Trade of Crude and Products
(in 1,000 metric tons)

	Imports		Exports	
	1959	1960	1959	1960
Crude oil	24,793.8	28,781.9	476.3	518.5
Gasoline	32.2	92.8	1,752.5	1,933.4
Kero. & jet fuel	0.23	0.21	338.9	446.0
Gas oil & diesel fuel	3.67	3.17	2,079.8	2,689.5
Fuel oil	589.3	1,424.9	3,891.4	3,792.1
Lubricants	45.1	80.2	49.9	108.3
Others	142.2	234.5	147.7	208.7
Totals	25,606.6	30,617.6	8,776.5	4,756.5

Note: exports decreased sharply for light and middle distillates, including gasoline, and for lubricants. Decline in residual fuel export is due mainly to the expanded internal demand. Source: "Istituto Naz. di Statistica" Roma.

TABLE 4—Geographic distribution of Italian oil exports
(1,000 metric tons)

	Gaso.	%	Kero.	%	Gasoil	%	Fuel	%
Europe	1,524	76.4	206	46.2	2,203	82.0	1,003	26.4
Asia	58	2.9	37	8.4	34	1.3	518	13.7
Africa	180	9.1	60	13.5	204	7.5	217	5.7
America	87	4.4	6	1.3	5	0.2	71	1.9
Other or unspecified	144	7.2	136	30.6	243	9.0	1,984	52.3
Totals	1,933		445		2,689		3,793	

million ton/yr refinery, equipped with a 700 ton/day cat reformer, on the northeast shore of Sicily, with excellent landing and tankage facilities. The new refinery in Sardinia (near Porto Torres on the north coast of the island) will probably reach completion by 1963.

The biggest program under way is the 150 billion lire refining and petrochemical ENI complex at Gela (Sicily), rapidly taking shape. A big coker will be the heart of the complex. It will process the bituminous crude of the Gela oilfield to about 3 million ton/yr of products, including sulfur (the crude contains above 6 wt-%), fertilizers, and coke to be burnt in a thermoelectric station for public distribution of electric power, as well as conventional petroleum products. Petrochemical utilization of olefins will also be a part of the Gela complex.

The year has marked a further step towards merging of small and medium-sized companies into the international groups. The "refinery dust" which used to be the Italian refining industry has settled down, and only the bigger and the stronger survived the latest years of strong competition. "Italia" refinery at Cremona (1.5 million ton/yr capacity) has been taken over by Amoco, who plan expansion and revamping. "Sarpom" refinery (Fiat-Caltex) near Trecate in the Po valley has reportedly been acquired by Esso. The 1.5 million ton/yr refinery, only one in Italy with fluid catalytic cracking, will be expanded to 4 million ton/yr, and its operation pattern modified in order to make it more suitable to the Italian market requirements.

"Sarom" refinery at Ravenna has been expanded to 3 million ton/yr and reforming capacity has been enlarged. "Rasiom" refinery at Augusta (Sicily) will increase capacity from the existing 5.2 million to 8.5 million ton/yr. With the planned expansion, the refinery—presently the largest in Italy—will become one of the largest in Europe. Planned expansion also includes the largest European complex for solvent refining of lubricating oils (overall capacity 200,000 ton/yr.). A wide range of products for automotive and industrial purposes will be manufactured. The new lube plants will start production by 1963. Distribution will be through Esso.

Other recent projects, approved by the Ministry of Industry, are:

ANIC (ENI group)—new refinery in the Po valley; capacity 2 million ton/yr.

Sorap (Edison group)—new refinery in northern Italy, connected to Genoa by pipeline; capacity 3 million ton/yr.

Mediterranea Petroli—new refinery in Sardinia; capacity 1 million ton/yr.

Clasa—new refinery near Civitavecchia (Rome); capacity 1 million ton/yr.

DICA—refinery in Carrara-Avenza to be dismantled and transferred to Civitavecchia; capacity to be raised to 3 million ton/yr.

Shell Italiana—"Condor" refinery at Rho near Milan to be expanded to 4 million ton/yr.

Mobil Oil Italiana—refinery at Naples to be expanded to 4.5 million ton/yr.

Italia-Amoco—refinery at Cremona to be expanded to 3 million ton/yr.

ICIP—refinery at Mantua to be expanded to 2 million ton/yr.

If all the above programs go to completion, Italian refining capacity could become the largest in Europe, at 60-65 million ton/yr.

Motor gasoline retail price—after reduction of prices at the refineries and of taxes, effective February 1st, 1961—is the lowest since post-war years. This does not mean, however, that Italian gasoline is cheap.

For regular gasoline (84-86 RM ON), price per litre at the refinery, including expenses and profit, is 26 Lire. With tax of 70 Lire per litre, service station price is 96. For premium grade (98-100 RM ON), the refinery price is 34, tax is 72 and service station price is 106 Lire per litre.

In the present state of development of refining in Italy, there is a special interest in the production of petroleum fractions for petrochemical purposes. These materials, to which special tax exemptions have been granted, have quickly found a large market in Italy. Their consumption, almost non-existent in 1957, had reached 255,000 tons in 1959 and surpassed 360,000 tons in 1960. Their rapid acceptance and increasing demand in the Italian market have partly relieved the situation of the light fractions, presently in oversupply owing to the consumption pattern, which is heavily shifting towards the black products.

Price of virgin naphthas to petrochemical industries is rather low (11-13 Lire/kg, about one cent/lb) and compares favorably, on a Btu basis, with natural gas which is sold by ENI to chemical industries at 6-8 Lire/cubic metre. Natural gas, how-

(Continued on page 110)

Mizushima will be a typical Japanese petroleum-petrochemical complex. Mitsubishi's new refinery is on near side of harbor; Nihon Mining Co.'s plant on far side. Mitsubishi Kasei will build petrochemical facility just to left of Nihon Mining.

Oil will supply two-thirds of Japan's energy by 1980

by Masaya Ishii*

JAPANESE INDUSTRY has undergone a remarkable development, with the demand for industrial goods, raw materials, and energy increasing rapidly. The demand for petroleum products in particular has had a radical growth, some hundred-fold since 1945.

The changes in energy source percentages, as shown in Table 1, illustrate a basic reason for this great rise in demand for oil. In 1945, petroleum supplied only 0.9% of the country's total energy requirements. It rose to 29% in 1959 and is expected to hit almost two-thirds in 1980.

Why has this change occurred? Basically, coal is the most important natural energy source for modern industry in Japan. However, the price has become extremely high—a recent world-wide trend but especially severe in Japan—due to improvident production methods during World War II and labor difficulties thereafter.

Further, water power—hitherto abundant in Japan—is in short supply because all economic sources have been fully developed.

As a result, industry must depend on oil, of which there is an assured, stable supply at a relatively low price.

Although energy consumption is not exactly in direct proportion to national income, there does exist an inevitable relationship between the growth of the two within the same economic structure.

In general, we may expect energy consumption to double if a plan to double national income should be realized within 10 years. Moreover, with petroleum products being used in place of other energy sources, the demand for petroleum will be increased in abnormal proportion.

According to the plan to double the national income, the Government has announced a trial estimate of petroleum consumption, as shown in Table 2. To keep pace with this, the refining facilities must rise proportionately. Table 3 shows a tentative estimate made by the Facility Committee of the Japan Petroleum Association.

A trial estimate also worked out on crude oil sources is shown in Table 4. Imports from the Middle East are rising, while those from Asia are dropping, due to the sharper increase in Mid-East total crude production.

Petroleum is used not only for energy, but also as a raw material in chemicals. Large scale industrial zones may be developed where an industry using oil for energy cooperates with a chemical industry using it as a raw material. In Japan we term this type of zone a "Kombinat," and plans of this sort may be found in a number of

*Mr. Ishii is chief, public relations section, Mitsubishi Oil Co. Ltd., Tokyo.

TABLE 1—Trends in Japan's Sources of Energy, 1945-1980

(percent of total)

Year	Hydro-electric	Coal	Petro-leum	Nat. Gas	Others*
1945	32.7	49.0	0.9	0.1	17.3
1950	32.7	51.1	6.3	0.1	9.8
1955	30.5	44.0	17.9	0.3	7.3
1959	27.6	37.8	29.2	0.6	4.8
1980	14.0	22.2	62.6	0.6	0.4

* Lignite, wood, and charcoal.

TABLE 2—Trends in Domestic Products Demand in Japan

(in average barrels daily)*

Product	1955	1959	1960	1965	1970
Gasoline	45,890	81,030	99,500	196,450	299,600
Naphtha	——	11,850	15,750	32,500	53,400
Jet fuels	35	2,850	3,500	6,650	10,350
Kerosine	9,350	26,575	32,625	60,900	82,700
Gas oil	14,450	27,850	36,600	76,900	104,650
Fuel oil	100,225	210,425	305,750	617,800	995,000
Lube oils	7,375	11,825	13,825	25,400	33,950
Totals	177,325	372,400	507,550	1,016,650	1,579,650

* Converted from government estimates in 1,000 kl/yr; 1 kl—6.29 bbl.

TABLE 3—Processing Required to Meet Japan's Products Demands by 1970

(capacities in b/sd)

Process	1960	1970
Topping	730,000	2,572,000
Vacuum dist.	142,000	514,000
Reforming	47,920	429,000
Cat. cracking	48,800	231,000
Alkylation	1,250	12,000
Coking	5,300	74,200
Visbreaking	4,500	32,000
Desulfurization	33,000	211,100
Gas treating	115,000	229,000
Kerosene treating	43,650	46,290
Extraction	7,920	44,000
Dewaxing	10,200	44,000
Press dewaxing	4,610	5,740
Deasphalting	4,760	14,560

TABLE 4—Trends in Sources of Crude Run in Japan's Refineries

(Volumes in 1,000 bbls for each fiscal year)

Crude Source	1961 Volume	1961 Percent	1965 Volume	1965 Percent	1970 Volume	1970 Percent
Middle East:						
Saudi Arabia*	59,906	27.1	75,757	19.7	122,674	21.2
Wafra	9,737	4.4	21,065	5.5	28,399	4.9
Kuwait	51,653	23.3	147,444	38.6	213,539	66.8
Zubair	47,420	21.4	63,189	16.6	113,585	19.6
Iran	10,158	4.6	26,978	7.1	44,867	7.7
Mid-East Totals	178,875	80.8	334,433	87.7	523,064	90.2
Mid-East b/d	(490,070)		(916,250)		(1,433,050)	
Southeast Asia:						
Seria	7,410	3.3	2,585	0.7	2,837	0.5
Duri	10,158	4.6	14,410	3.7	15,901	2.7
Minas	5,082	2.2	4,439	1.2	10,787	1.9
Lirik	1,271	0.6	1,107	0.3	1,138	0.2
North Sumatra	6,774	3.1	8,133	2.1	9,655	1.7
Others	1,271	0.6	3,327	0.9	3,403	0.6
S.E. Asia Totals	31,966	14.4	33,997	8.9	43,722	7.6
S.E. Asia b/d	(87,575)		(93,140)		(119,790)	
United States	849	0.4	1,107	0.3	1,132	0.2
United States b/d	(2,325)		(3,035)		(3,100)	
U.S.S.R.	9,762	4.4	11,869	3.1	11,869	2.0
U.S.S.R. b/d	(26,750)		(32,500)		(32,500)	
Total imported crude	221,452		381,407		579,787	
Total imported crude b/d	(606,720)		(1,044,950)		(1,588,450)	
Domestic crude	4,139		5,586		6,441	
Domestic crude b/d	(11,340)		(15,300)		(17,650)	
Grand total	225,591		386,993		586,228	
Grand total b/d	(618,060)		(1,060,250)		(1,606,100)	

* Includes Safaniya crude oil.

areas. Typical are the Tokyo Bay area, Nagoya, Yokkaichi, Osaka Bay, Mizushima, and Tsurusaki.

As a result of Japan's reclamation plan, large areas of land will be available for such Kombinat enterprises. Recent technical developments make possible the creation of extensive industrial land by reclaiming shallow bays. Furthermore, dredging provides artificial harbors superior to natural harbors to accommodate large ships and super tankers. Such plans are being carried out in Tokyo and Osaka Bays, and in Mizushima and Tsurusaki.

Mizushima is the most ambitious and already partially realized. The harbor is now dredged to a depth of 13 meters in the ship channels. When it is increased to 16 meters by the current project, the world's largest tankers will be able to use it.

At the moment, the only operating plant in this area is Mitsubishi Heavy Industry, but Mitsubishi Oil and Nihon Kogyo refineries are now under construction. Chubu Electric Power Co. will provide electricity generated by fuel oil from the refineries. Mitsubishi Kasei (Chemical) Co. is also building a petrochemical plant, and a large steel mill is also reportedly planned.

Japan's major petrochemical activities are shown in Table 5. A more detailed list of individual companies is published elsewhere in this issue.

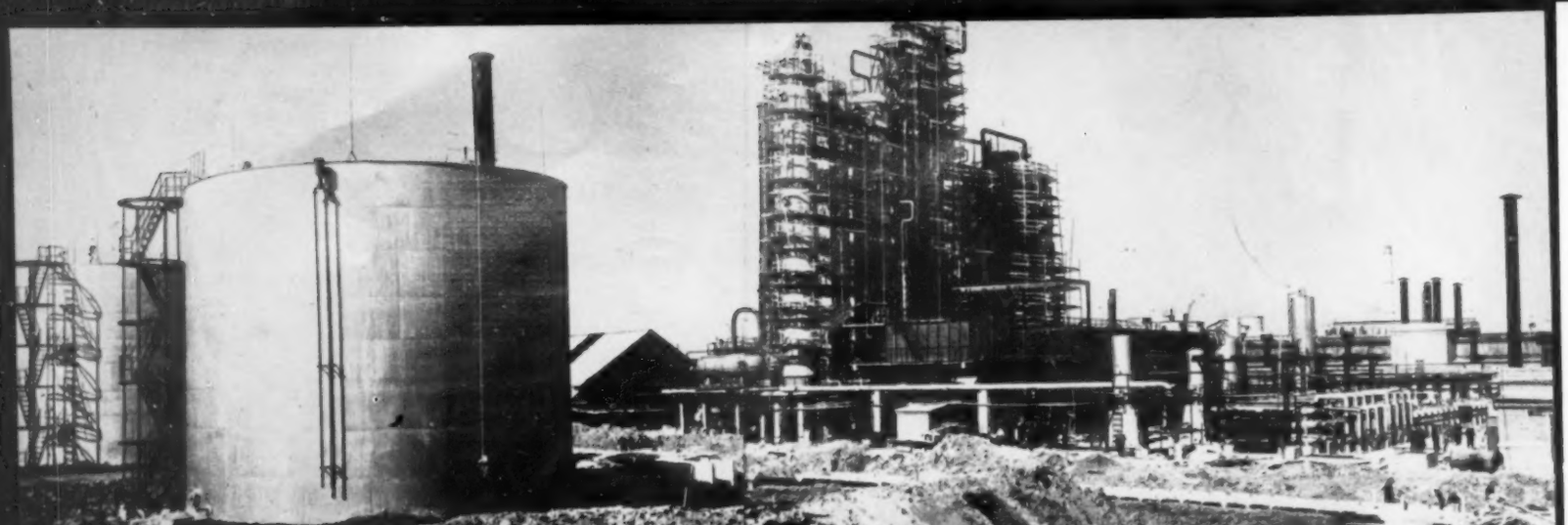
The country's rapidly growing petrochemical industry faces two major problems—marketing and raw materials. For example, Japan does not provide a large market as is true in the USA. Export is also an unexplored field. However, it is evident that petrochemical products exported from Europe and the USA—many of them to Japan—are very low in cost. Therefore, lower cost production methods must be developed.

In the case of an industry which requires a large amount of manpower—such as spinning—wages form a large part of the cost. In this instance, Japan might have certain advantages over the USA. However, in the case of petrochemicals—which is highly automated—cost is determined largely by the cost of raw materials. This is the reason that Japan's petrochemical industry will be integrated into the Kombinat plan. END

Note: The data on petrochemical projects reported in the text and tables of the preceding article include only those reliable projects approved by the Government. The detailed listings for Japan in the survey of the World's Petrochemical Plants elsewhere in this issue includes several additional projects on which data has been reported but which have not yet received government approval.

TABLE 5—Major Petrochemicals in Japan, 1961

Product	Capacity, ton/yr Present	Capacity, ton/yr Building	Company & location
Acetaldehyde	——	31,500	Shin Nippon Nitrogen, Goi
Acetic acid	——	7,200	Dainippon Celluloid, Otake
Acrylonitrile	——	5,000	Asahi Kasei, Kawasaki
	——	7,200	Mitsubishi Kasei, Yokkaichi
	——	7,200	Nitto Chemical, Kawasaki
Alkyl benzene	——	15,000	Nippon Petroleum Soap, Kawasaki
Aromatics (B-T-X)	44,000	——	Maruzen Oil, Matsuyama
	21,600	——	Mitsubishi Oil, Kawasaki
	36,000	——	Mitsubishi Petrochemical, Yokkaichi
	38,400	——	Mitsui Petrochemical, Iwakuni
	——	29,200	Nippon Sekiyu Kagaku, Kawasaki
Butadiene	33,500	——	Nippon Synthetic Rubber, Yokkaichi
Butyl acetate	——	7,200	Dainippon Celluloid, Otake
Ethylene	——	41,300	Kyowa Fermentation, Yokkaichi
	22,000	60,000	Mitsubishi Petrochemical, Yokkaichi
	20,000	——	Mitsui Petrochemical, Iwakuni
	——	20,000	Mitsui Petrochemical, Otake
	40,000	10,000	Nippon Sekiyu Kagaku, Kawasaki
	12,000	26,500	Sumitomo Chemical, Oe
	——	40,000	Toa Nenryo Petrochemical, Kawasaki
Ethyl hexanol	6,000	——	Mitsubishi Kasei, Yokkaichi
Ethylene oxide	10,800	——	Nippon Catalytic Chemical, Kawasaki
Ethylene glycol	7,200	——	Nippon Catalytic Chemical, Kawasaki
Isobutanol	1,680	——	Mitsubishi Kasei, Yokkaichi
Polybutylene	——	2,000	Furukawa Chemical, Kawasaki
Polyethylene	——	24,500	Dainippon Celluloid, Otake
	9,000	——	Furukawa Chemical, Kawasaki
	10,000	40,000	Mitsubishi Petrochemical, Yokkaichi
	12,000	——	Mitsui Petrochemical, Iwakuni
	——	24,500	Mitsui Polychemical, Otake
	——	27,000	Nitto Unicar, Kawasaki
	10,000	——	Showa Yuka, Kawasaki
	11,000	39,000	Sumitomo Chemical, Oe
Propylene	——	20,600	Kyowa Fermentation, Yokkaichi
	20,000	45,000	Mitsubishi Petrochemical, Yokkaichi
	13,000	——	Mitsui Petrochemical, Iwakuni
	——	40,000	Mitsui Petrochemical, Otake
	35,000	8,000	Nippon Sekiyu Kagaku, Kawasaki
	8,000	23,000	Sumitomo Chemical, Oe
	——	32,000	Toa Nenryo Petrochemical, Kawasaki
Propylene oxide	——	3,600	Showa Denko, Kawasaki
Propylene glycol	——	1,200	Mitsui Chemical, Nagoya
	——	3,600	Showa Denko, Kawasaki
Polypropylene	——	10,000	Mitsui Kagaku, Otake
	——	13,000	Shin Nippon Nitrogen, Goi
	——	10,000	Sumitomo Chemical, Oe
Polystyrene	16,800	——	Asahi Dow, Kawasaki
	——	7,000	Kokan Chemical, Kawasaki
	14,400	——	Mitsubishi Monsanto, Yokkaichi
Styrene monomer	18,000	18,000	Asahi Dow, Kawasaki
	——	13,000	Kokan Chemical, Kawasaki
Rubber (styrene-type)	2,400	——	Nippon Geon, Kawasaki
	50,000	——	Nippon Synthetic Rubber, Yokkaichi
Rubber (nitrile type)	2,400	——	Nippon Geon, Kawasaki



This fully automated refinery at Novo Gorkiy (RSFSR) processes Tatar crude and produces both conventional products and some petrochemicals.

Eastern European process plants start big upswing

by Rudolf Sobotka*

Substantial gains in refining and petrochemicals seen for all central and eastern European countries by 1965. USSR capacity will more than double, reaching 5.4 million b/d

PROCESSING IN EASTERN and central Europe, especially the Soviet-bloc countries, is beginning to show large increases. Many new refineries and petrochemical plants are to be completed during the coming five years.

Data on crude running capacities are summarized in Table 1. Reviews of refining and petrochemical activities in each country follow below.

Capacity is expected to double in the Soviet bloc by 1965, rising from 2,846,200 b/d today to about 6 million b/d. The increase in the USSR will be from the present 2.39 million b/d to a level of 5.4 million b/d. On the basis of the expected rise in total world capacity, Russia's share of that total can be expected to grow from today's approximate 11.5% to nearly 18%.

In 1960, Austria's six refineries (at Schwechat, Voesendorf, Floridsdorf, Kagran, Neusiedl, and Kledering) turned out 1,891,661 tons (35,000 b/d average) of products. They were: gasoline — 281,546 tons (5,230 b/d), kerosine—40,513 tons (750 b/d), gas oil—606,012 tons (11,270 b/d), fuel oil—817,226 tons (15,200 b/d), lube oil—78,674 tons (1,460 b/d), and bitumen—67,690 tons (1,260 b/d).

Consumption of products in 1960 increased by 17.5% to 2,828,089 tons (52,600 b/d), from 2,407,564 tons (44,775 b/d) in 1959. Sharpest increases were in motor gasoline (17.35%), bitumen (16.2%), lube oils (16.14%), and gas oil (15.27%).

Total crude capacity in 1960 reached 57,420 b/d. Capacity of vacuum distillation (Schwechat, Kagran) was 2,200 b/d; thermal cracking (Schwechat) was 5,210 b/d; and catalytic reforming (Schwechat) was 5,000 b/d.

At the beginning of 1960, OeMV (the Austrian government enterprise) put its new $22.4 million Schwechat refinery into operation and shut down its 6,510 b/d Moosbierbaum and 5,580 b/d Korneuburg refineries as well as some units of the old Schwechat plant. Also shut down was Shell/Mobil Oil's 8,275 b/d Lobau refinery that had been leased to OeMV until end-1960.

The new Schwechat refinery consists of a 36,000 b/d distillation unit, a 5,000 b/d catalytic reforming plant, a 2,100 b/d bitumen plant, and a gas processing plant. A 5,000 b/d catalytic cracking plant is under construction, scheduled for completion in 1962. The LPGas plant makes Austria independent of liquefied gas imports (1960—13,000 tons).

Domestic products output does not cover demand. Imports are therefore necessary. In 1960 they amounted to 1,220,785 tons (22,700 b/d) compared to 1959—

TABLE 1—Refining Capacities in Central and Eastern Europe
(in barrels daily)

Country	1960	1965
Austria	57,420	NA
Yugoslavia	39,200	63,200
Albania	8,223	NA
Bulgaria	2,390	44,000
Czechoslovakia	33,440	98,500
Germany (East)	NA	100,000
Hungary	45,990	80,000
Poland	17,686	71,150
Romania	248,466	NA
USSR (est)	2,390,000	5,400,500
TOTAL Soviet bloc	2,846,200	5,794,150

*The author, Dr. Sobotka, a native of Czechoslovakia, studied at the University of Vienna. He is now chief editor with the United States Information Service in Vienna, with special field being the policy and economy of Soviet bloc countries and central Europe.

970,924 tons (18,600 b/d), with a value of $37,334,380 (1959—$31,539,000). East-bloc countries supplied 50.4%—616,138 tons (11,460 b/d) worth $12,683,920 (33.9%), against 50.1%—495,929 tons (9,225 b/d) worth $11,624,760 (37.0%) in 1959. Austria exported 156,871 tons (2,920 b/d) of petroleum products (1959—186,072 tons, or 3,460 b/d) in the value of $5,447,680 (1959—$5,897,000). Most important export item was gas oil, which went almost exclusively to West Germany.

Petrochemicals: Austria's first petrochemical plants were completed in mid-1961. They were the $1.6 million, 10,000 ton/yr methanol works at Fischamend of HIAG-Werke A.G., and the $8 million "Danubia Petrochemia A.G." works at Schwechat, which will produce 5,000 ton/yr of polypropylene under license from Italy's Montecatini. The product will be marketed under the name of "Daplen." Danubia Petrochemie is owned 40% by Oesterreichische Stickstoffwerke, 20% by the government, and 40% by Montecatini. Raw material will be imported until the 5,000 b/d catalytic-cracking plant at OeMV's Schwechat refinery is completed in 1962.

Farbwerke Hoechst A. G. has indicated plans to produce polyethylene—in partnership with other companies—using 5,000 to 7,000 ton/yr ethylene from OeMV.

Albania has one refinery, at Cerrik, with a capacity of 150,000 ton/yr (2,741 b/d), and a 300,000 ton/yr (5,482 b/d) skimming plant at Stalin. Sometime between 1961 and 1970 one more refinery is to be built.

Bulgaria has two old refineries at Ruse. Between 1956 and 1960 their capacity increased from 50,000 tons (996 b/d) to 120,000 tons (2,390 b/d).

In 1960 construction started at Ruse of a 15-million-Leva ($220,588) distillation unit. After its completion, Ruse will be able to process the entire Dobrudzha crude output, which in 1960 was 200,000 tons (3,983 b/d). The capacity of the bitumen plant is to double to 40,000 ton/yr (796 b/d).

In October 1960, construction was started at Burgas of a Soviet-designed, supplied, and financed 2 million ton/yr plant, first stage to be completed in 1963. Crude will be shipped from the Soviet Union across the Black Sea. The refinery will also have a petrochemical plant that will turn out 10,000 ton/yr of polyethylene, synthetic ethanol, phenol, some other chemicals, and liquefied gases. The Soviet Union has also agreed to assist Bulgaria in the constuction of a synthetic rubber plant.

Czechoslovakia has five oil refineries (at Pardubice, Valaske Mezirici, Moravska Ostrava, Kolin, Bratislava) and a synthetic fuel plant with a crude processing unit (at Zaluzi).

The 1960 capacity totaled 1.8 million tons (33,440 b/d). Planned capacity for 1965 is 5.3 million tons (98,449 b/d).

In 1956, expansion of the "Slovnaft" oil refinery at Bratislava was begun, making it the biggest and most modern plant of its kind in Czechoslovakia. In 1965 it will supply 60% of the total gasoline and one-third of the lube oils. Crude capacity in that year is planned to reach 5 million tons (92,876 b/d).

The Kolin refinery is to be increased between 1961 and 1965 by 50%. An oil regeneration plant at Kralupy, a subsidiary of Kolin refinery, is to be transferred to Kolin, and a dewaxing plant is planned.

The synthetic fuel plant at Zaluzi plans to increase its output of liquid fuels from petroleum, including gasoline, jet fuel, and such petrochemicals as sulfur, methanol, phenol, toluene, xylene, and ammonia.

The petrochemical industry has hardly developed, due to Czechoslovakia's small output of oil and gas. Between 1961 and 1965, several petrochemical works are to be built; including a nitrogen plant at Zala that will use gas from the Vysoka field, and a synthetic rubber plant at Bratislava.

The petrochemical plant of the "Slovnaft" refinery at Bratislava is to be completed by 1965. Main products will be polyethylene, synthetic detergents, and rubber.

East Germany has one refinery, at Luetzkendorf. A new refinery now under construction at Schwedt will process Soviet crude, piped from Kuybyshev across Poland. Planned capacity in 1970 is 8 million ton/yr (160,000 b/d).

Petrochemicals: East Germany will concentrate on the development of a petrochemical industry. Though lacking any significant oil and gas production, East Germany will be given a primary position as chemical products producer because the Soviet Union apparently wishes to permit it to make the most productive use of its skills, manpower, and know-how in the chemical field. A petrochemical plant is to be built at the Schwedt refinery, for completion in 1965.

In April, 1961, a consortium of four Soviet-bloc countries (East Germany, Czechoslovakia, Poland, and Romania) signed an agreement concerning the purchase of plants and technical information for the production of high-pressure polyethylene, from Great Britain's Imperial Chemical Industries and Simon-Carves Ltd. This was the first time that these bloc countries had entered the "capitalist" market as a consortium, and it was the first time that East Germany purchased technical information from Great Britain.

In Hungary, the six refineries—at Almasfuzito, Csepel, Szony, Petfurdo, Zalaegerszeg and Nyirbogdany—processed 2 million tons of crude oil (41,808 b/d) last year.

Construction started last year as Szazhalombatta, 16 miles south of Budapest, of the 3 million ton/yr (60,000 b/d) "Duna" refinery that will be supplied with Soviet crude oil through a 1,055-mile pipeline. By 1965, Hungary plans to have a total crude capacity of 4 million tons (80,000 b/d).

The Szony refinery, with Soviet and East German assistance, will raise crude capacity to 1.5 million ton/yr (31,356 b/d). A one-million ton/yr (20,905 b/d) crude distillation unit has been under constuction since 1959. Hungary's first thermal cracking plant, 400,000 ton/yr (8,361 b/d), has been under construction since 1955. Blueprints and installations have been supplied by the USSR. Original date of completion was 1958, new date is 1961. Planned by 1965 is an atmospheric distillation unit and a reforming unit.

Petrochemicals: Construction of Hungary's first petrochemical works started at Tiszapalkonya in 1959. The Soviet Union is supplying most of the installations. There will be production units for resin (6,000 ton/yr), nitrogen fertilizer, polyethylene (10,000 ton/yr), and varnishes. Romania will supply the raw material, 7,062 million cubic feet of gas per year with a methane content of 98%, through an 84-mile pipeline. By 1965, Hungary plans to process in petrochemical plants more than 200 million cubic meters (7,062 million cubic feet) of natural gas and 60,000 tons (1,254 b/d) of petroleum distillates.

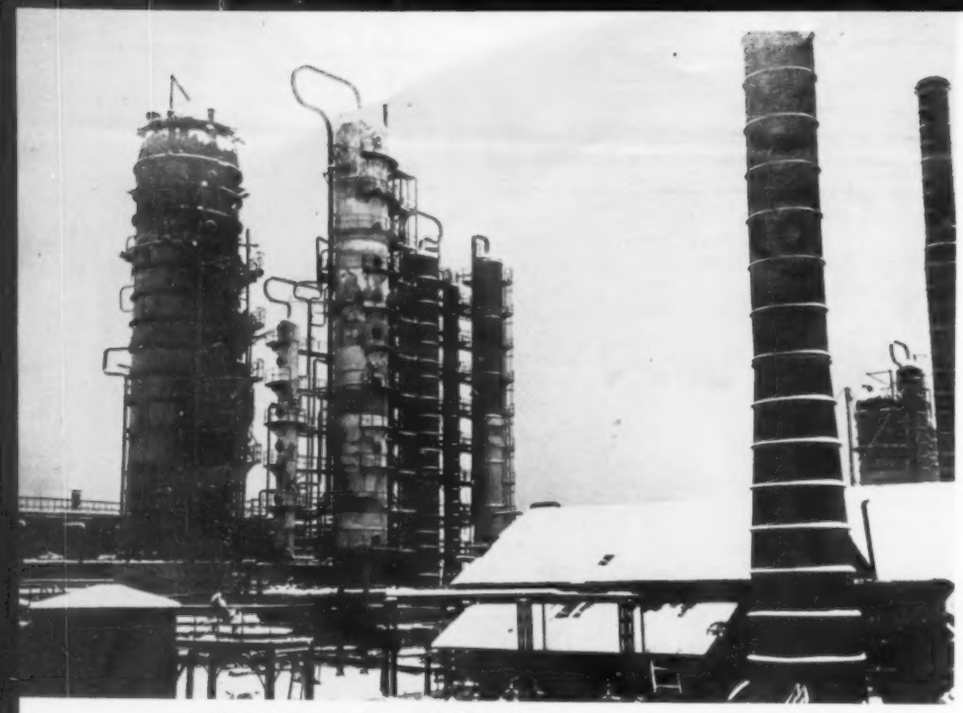
Poland's five refineries (at Jedlicze, Jaslo, Glinik Mariampolski, Trzebinia, and Czechowice) processed in 1960 some 800,000 tons (16,263 b/d) of crude, covering 38% of domestic demand. In 1950, they processed 270,000 tons (5,489 b/d), and in 1958, 750,000 tons (15,247 b/d). Planned capacity in 1965 is 3.5 million tons (71,150 b/d).

In August 1958, Poland secured Soviet assistance in construction of a new refinery, and in 1960 the ground-breaking began on a 0.96 square mile site at Plock.

This new plant will be Poland's biggest investment project during the 1961-1965 period. It will have distillation, reforming, catalytic cracking and coke units. The USSR will supply crude via pipeline—an asphaltic, low-paraffin, low-sulfur Romashkino crude. The first construction stage, consisting of distillation, catalytic and thermal cracking units, is to be completed in 1964, with crude capacity being 2 million tons (40,657 b/d). During the second construction phase, 4 million ton/yr (81,315 b/d) of primary capacity, and lube oil and a paraffin plant are to be added until 1967.

Petrochemicals: Beside the Plock refinery, a petrochemical plant is to be built, with its first units planned for completion in 1965. When the capacity of the Plock refinery reaches 4 million tons (81,315 b/d), the petrochemical plant is to receive 160,000 ton/yr of dry gas and 180,000 ton/yr of liquefied gas (propane, propylene, butane, butylene) for further processing.

The following annual output (in tons) is envisaged: polyethylene—20,000, polystyrene—15,000, polypropylene—10,000, phenol—40,000, acetone—25,000, glycol—10,000, artificial fertilizer—60,000, and other products—250,000. Estimated value of petrochemical products in 1965 is $12 million. Investments for the 6 million ton/yr (121,972 b/d) refinery plus the



A refinery at Angarsk, near Irkutsk (RSFSR), a new center growing to supply southeastern RSFSR, Mongolia, and China.

petrochemical plant will be about $2.4 billion.

After completion in 1968, the nitrogen works at Pulawy is to turn out 330,000 tons of fertilizer (in terms of pure nitrogen) and acetylene that will be processed into polyvinylchloride.

At Mokre, Poland's first polyester factory is being built under the license of Imperial Chemical Industries Ltd. The plant will first use coal derivatives as raw máterial and later switch to oil derivatives. Output of the polyester fiber is to be 4,500 tons in 1965 and 21,000 tons some years later.

Also, the synthetic rubber plant at Oswiecim, built between 1955 and 1958, is to switch by 1970 from coal to oil as raw material. Output in 1960 was 20,000 tons, in 1962 it is to be 32,000 tons.

Refining is an old trade in Romania. The first plant was built at Rifov, near Ploesti, in 1857; its capacity was 600 ton/yr (12 b/d). In 1960, Romania had 10 refineries able to process tthe country's entire crude output. Capacity was 12.2 million tons (248,466 b/d), thermal cracking was 3.8 million tons (77,835 b/d), and catalytic cracking was 250,000 tons (5,100 b/d).

The most important refineries are No. 1 (Ploesti), No. 3 (Teleajen), No. 7 (Brazi), No. 8 (Darmanesti), and No. 10 (Onesti). Ploesti now has the highest throughput capacity, equal to about one-third of Romanian crude output. Onesti, which went into partial operation in August 1956, is to become the biggest and most modern plant of its kind on the Balkan Peninsula. It includes crude distillation, thermal cracking plants, and Romania's first catalytic cracking unit, a 250,000 ton/yr (5,100 b/d) unit. Another 5,100 b/d Fluid catalytic cracking plant is nearing completion now.

Petrochemicals: The Romanian chemical industry, of fairly recent growth, is concentrating chiefly on the production of petrochemical products. The first petrochemical plants were built in 1957/1958. By 1965, 13,000 tons of synthetic fibers are to be produced, against 300 tons in 1959. In 1965, petrochemical works will produce 880,000 tons of products (expressed in carbon), of which 500,000 tons are to come from natural gas and 380,000 tons from refinery gases. Several petrochemical plants are under construction; the center is Onesti-Borzesti.

At Onesti, a petrochemical plant will turn out this year: 25,000 tons of synthetic rubber, 9,000 tons of phenol, 5,500 tons of acetone. The final capacity will be double the 1961 output. At Borzesti, a plant under construction will produce in 1962: 12,000 tons of polyvinyl chloride; final capacity is 26,000 tons.

USSR: The year 1958 saw a turning point in the economic planning of the Soviet Union, when the authors of the 1959-1965 State Plan gave the oil, gas, and chemical industry priority over iron and steel, attempting to make good the neglects of the past.

The USSR has proved oil reserves estimated at 3.23 billion tons (23.48 billion bbl), probable reserves at 6-8 billion tons (44 to 58 billion bbl), and recoverable gas reserves at 375 billion cubic meters (13.24 trillion cubic feet). According to the plan, crude output is to increase from 148 million tons (2,947,836 b/d) in 1960 to 230-240 million tons (4,581,096 to 4,780,274 b/d) in 1965. In that year 137.5 million tons (2,738,698 b/d) of crude are to be consumed locally, leaving 102.5 million tons (2,041,575 b/d) for export.

No official data are available concerning the number of refineries, their capacities or locations. At least 60 locations of refineries are known, many with more than one plant. It is assumed that the total varies between 100 and 120. Their capacity in 1959 was 113 million tons (2.25 million b/d).

Between 1959 and 1965 capacities are to increase as follows: primary—2.2 times, cracking—4.3 times, catalytic reforming—16-18 times, lube oils—2 times. By 1965 crude capacity should reach 271 million tons (5,400,466 b/d). Since the Planning Commission hopes the new facilities will enable refining to catch up with crude production by 1965, some 30 million tons (597,534 b/d) of capacity might be destined for shut-down.

The center of refining has gravitated from the old Baku area to the Volga-Ural area. In 1960 the construction of 16 refineries was begun. This year, 17 refineries are to be completed. Six or seven giant refineries are to be built between 1959 and 1965 in the RSFSR alone. During the same period, Bashkiria's crude capacity is to increase 1.5 times.

The largest complex of refineries is at Chernikovsk (RSFSR). The USSR is now concentrating on the construction of high-capacity refineries. In the future, more emphasis is to be placed on the output of diesel fuel, now that most Soviet tractor factories are turning out vehicles with diesel engines.

Synthetic gasoline production was started in the Soviet Union shortly after World War II. Today, more than 40 synthetic fuel plants are in operation.

TABLE 2—Soviet Crude Output and Estimate of Processing Capacities
(in million b/d)

Year	Production	Crude Capacity	Cracking
1938	0.60	0.56	—
1948	0.58	0.62	0.23
1955	1.44	1.29	0.59
1956	1.66	1.61	—
1957	1.95	1.85	—
1958	2.25	2.09	—
1959	2.57	2.25	—
1960	2.94	2.39	1.11
1965	4.58 to 4.78	4.78	—

Petrochemicals: Before 1917 there was practically no chemical industry in Russia except for a small output of fertilizer, explosives, and soap. Most products were imported. A synthetic rubber pilot plant was opened in 1931 in Leningrad, followed in 1933 by the first big production plant. Raw material was ethanol from potatoes. Not until 1959 did Soviet plants switch to using synthetic ethanol from ethylene, from petroleum.

The first plastics were produced in 1957 at the Cheremkovsk refinery, later followed by Novo-Kuybyshevsk and Stalingrad. The first synthetic detergent factory started producing at Krasnovodsk at the end of 1958.

In 1956, Soviet gas output was 13.7 billion cubic meters (483.7 billion cubic feet), or 4% of the USA output. Large-scale construction of gas-chemical works started only recently. In 1965, gas output will reach 150 billion cubic meters (5.3 trillion cubic feet), 80% of which is destined for energy production, the remaining 20% for petrochemicals. Statistics are still vague concerning the present state of petrochemicals. In 1960 utilization of the gas

(*Continued on page 113*)

Annual review of USA patents on petroleum refining and processing

by Heinz Heinemann and P. A. Lefrancois

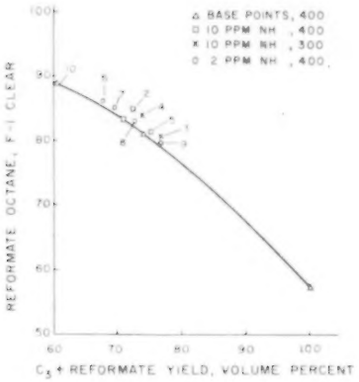


Fig. 1—Addition of ammonia to the feed to the last reactor of a series of reforming reactors containing a platinum catalyst supported on a halogenated alumina. USA Patent 2,956,945, R. Fleming and R. C. Jagel (to Sun Oil Co.)

THE TOTAL NUMBER of patents which had to be evaluated for this review has remained large and speaks for a continued heavy research effort within the Industry. More than 600 petroleum patents issued during the year.

No major breakthroughs can be reported, but much progress has been made in the refinement of older technologies. Some changes in emphasis have occurred. Since a period of three to five years normally elapses between the filing and issuing of a patent, some of these new trends have already resulted in new commercial processes. There are many new hydrocracking patents this year, coinciding with the announcement of processes to hydrocrack naphthas; the emphasis on dealkylation patents occurred simultaneously with several processes becoming available to make benzene from toluene or naphthalene from methylnaphthalenes.

Space limitations make it impossible to report on more than a fraction of the new patents in this review. The selection of what appeared most interesting and significant to the authors is necessarily arbitrary. No attempt has been made to cover the many new patents on catalyst preparation, since this subject was reviewed separately in a recent WORLD PETROLEUM issue (March, pp. 68-69).

CATALYTIC REFORMING. For quite a few years this has been the largest group of new patents issued. While this is again true this year, a trend toward broader distribution is noticeable and the number of reforming patents has declined. Those reported here are processing patents, most of the catalyst patents having been discussed in WORLD PETROLEUM's "Review of Recent Catalyst Patents." No new developments have occurred during the report period which indicate a radical change of technology. Almost all patents are concerned with improvements in the operation of well established processing principles.

Feed Preparation. The addition of small amounts of a nitrogenous base to reformer feed to prevent excessive hydrocracking is recommended by R. H. Dudley, R. B. Long, J. C. Rohrer and B. R. Strickland in Esso Res. & Eng. Co.'s 2,935,464. R. Fleming and R. C. Jagel in Sun Oil Co.'s 2,956,945 claim that isomerization in the last reactor and therewith yield and quality of reformate are improved by addition of a small amount of ammonia or amine to the feed to the last reactor. (See Fig 1.) Control of the water content of the feed to a regenerative-type platinum reforming operation is discussed in American Oil Co.'s 2,952,611 (M. R. Haxton, W. F. Johnston and K. A. Muller, Jr.). Blending of a reformer feed from the 260-420 F fraction of straight run naphtha and the paraffinic constituents of a 140-210 F reformate fraction is disclosed by C. K. Donnell, R. M. Kennedy and A. Schneider in 2,933,445 (to Sun Oil Co.). C. N. Kimberlin and W. J. Mattox (2,958,644 and 2,958,645 to Esso Res. & Eng. Co.) treat a fraction boiling below 200 F with molecular sieves and combine the effluent with a 200 F+ fraction prior to reforming.

Process Operation. A group of Esso Res. & Eng. Co. patents deals with process arrangements for naphtha reforming. Fractionation of a feed and reforming of the cuts at different severities is discussed by A. Voorhies in 2,937,132. D. D. MacLaren in 2,933,446 describes a fluidized bed reforming process with a platinum catalyst. C. N. Kimberlin (2,931,770) adds an inert heat transfer material to the fluidized bed.

Multistage reforming and subsequent fractionation and extraction are practiced according to W. F. Johnston (2,968,604 to American Oil Co.) and I. H. Lutz (2,968,609 to American Oil Co.).

A method of recovering fines from a fluid bed platinum reforming process is disclosed in The M. W. Kellogg Co.'s 2,941,938 (T. C. Virgil and M. F. Nathan). W. H. Decker (2,943,998) in a Sinclair Refining Co. patent adds hydrogen at a plurality of points in the first reactor, while B. S. Friedman in the same company's 2,947,682 follows platinum-alumina reforming with a HF-BF_3 treatment in liquid phase. Blending and separation steps are described in Standard Oil Co.'s (Ind.) 2,968,607 (W. S. Higley). That company's 2,943,999 (T. M. Moore and J. B. Corns) deals with startup operations. E. F. Ginter in Socony-Mobil Oil Co.'s 2,944,000 extends the onstream portion of a reforming cycle by reversing direction of flow. Two Gulf Res. & Dev. Co. patents (2,944,959, R. E. Kline, W. C. Starnes and R. C. Zabor; and 2,968,606, H. Beuther, R. E. Kline and R. C. Zabor) discuss multistage reforming over platinum or molybdena catalysts. Other typical patents in this category are U.O.P.'s 2,943,996 (C. H. Watkins), Phillips Petroleum Co.'s 2,931,768 (E. V. Mathy and E. J. Cabanaw), Texaco's 2,935,459 (H. V. Hess and E. R. Christensen) and British Petroleum Co.'s 2,963,417 (W. N. N. Knight).

Combination processes, involving reforming as one step are the subject of several patents, of which Tidewater Oil Co.'s 2,938,853 (E. J. Ammer and C. K. Viland) and Standard Oil Co.'s (Ind.) 2,938,854 (W. W. Sanders and R. J. Hengstebeck) are typical.

Aromatics Production. While almost all reforming patents involve aromatics production, a few are primarily concerned with aromatics for petrochemicals use. J. A. Guthrie (2,944,090 to Sun Oil Co.) feeds saturated hydrocarbons, comprising a large proportion of methylcyclopentane, to a platinum alumina catalyst at 875-975 F in the presence of hydrogen and of 3-9 ppm of ammonia to produce benzene. R. A. Blome, J. A. Andrews and W. S. Reaves (2,971,902 to Esso Res. & Eng. Co.) achieve their aim of aromatics production in multiple reactors by control of temperature and recycle.

Recycle Gas. Removal of ammonium chloride from reformer gas by an adsorbent is disclosed in Phillips Petroleum Co.'s 2,929,772 (F. E. Gilmore). J. Sosnowski, W. J. Maier, S. B. Sweetser and W. Priestley in Esso Res. & Eng. Co.'s 2,969,319 reduce HCl in recycle gas to below 5 ppm by treatment of the gas with a basic material contained on a high surface area support.

Product Treatment. The storage stabil-

ity of severely reformed naphtha is improved, according to L. D. Rampino and M. J. Gorham (2,946,742 to Tidewater Oil Co.) by mild hydrogenation with cobalt molybdate. Texaco's 2,943,037 (R. A. Woodle, J. K. McKinley, R. F. Huhndorff and C. H. McIntosh) discusses a multistage treatment of reformates, involving molecular sieves.

CRACKING. The major change noticeable in reviewing last year's patents in this area is the heavy emphasis on hydrocracking. Patents on catalytic cracking have become fewer. This trend is not surprising in the light of several new hydrocracking processes which have recently been announced. This section of the current review again minimizes discussion of catalyst patents, which were treated in a special review earlier in the year.

Feed Preparation. Removal of metal contaminants from catalytic cracking feed stocks continues as an active subject of research. E. A .Goldsmith (2,928,784 to California Research Corp.) treats metal rich feeds with hydrogen over sulfided catalysts as 350-600 F and 300-3000 psig. K. H. Faulk in Cities Service Res. & Dev. Co.'s 2,944,002 reduces feed metal content by treatment of the feed with steam and hot reject cracking catalyst. A. L. Conn and R. J. Hengstebeck (2,956,004 to Standard Oil Co. of Indiana) pretreat feed with finely divided, low activity catalyst in the pretreater. J. C. Dart and F. R. Walser in Houdry Process Corp.'s 2,958,650 remove metals deposited on cracking catalyst by attrition in a high turbulence zone.

Hydrocracking. A three-zone hydrocracking process is disclosed in Socony Mobil Oil Co.'s 2,971,900 (V. W. Weekman). The catalyst in the middle zone has more hydrogenation and less cracking activity than that in the other zones. I. Kirshenbaum, J. A. Hinlicky, R. M. Hill and E. Arundale describe hydrocracking of shale oil and of sulfur containing gas oil over platinum on eta alumina in two Esso Res. & Eng. Co. patents (2,958,651 and 2,958,652). J. A. Anderson in another Esso patent (2,974,099) hydrocracks a cat. cycle stock over cobalt molybdate in the presence of an aromatic diluent. The use of precious metal on silica-alumina catalysts for the hydrocracking of cycle stocks is discussed by F. G. Ciapetta, H. L. Coonradt and W. E. Garwood (2,945,805 and 2,945,806 to Socony Mobil Oil Co.) and multiple stage hydrocracking is disclosed by the same inventors in 2,945,800; 2,945,801; and 2,945,802. L. E. Gardner (2,970,102 to Phillips Petroleum Co.) employs a tungsten oxide and potassia on alumina catalyst, while W. C. Lanning in the same company's 2,953,515 proposes oxides of vanadium and molybdenum and metallic cobalt on alumina. A copper-chromium oxide catalyst on a fluorine activated alumina is disclosed in L. E. Gardner's 2,953,516.

In one of two Sinclair Refining Co. patents, (2,958,643) B. S. Friedman describes a process for making naphthalene and aromatic gasoline. In the other O. H. Thomas and C. D. Keith (2,964,462) catalytically crack a C_5-C_{12} paraffin over a catalyst comprising platinum and aluminum chloride on alumina.

Hydrocracking of hydrocarbon distillates over sulfided nickel or cobalt on siliceous cracking catalysts (Iso-cracking) is the subject of two California Research Corp. patents (2,944,005 and 2,944,006, J. W. Scott).

Other typical patents in the hydrocracking area are Sun Oil Co.'s 2,967,820 (H. L. Johnson, H. E. Reif and A. Schneider); M. W. Kellogg Co.'s 2,970,103 (J.W. Jewell) and Gulf Res. & Dev. Co.'s 2,945,802 (H. Beuther and R. A. Flinn).

Catalytic Cracking Operation. A moving bed cracking process employing kaolin clays is discussed by R. E. Ashwill and N. M. Kapp (2,928,793 to Houdry Process Corp.). J. H. Krause (2,951,805 to Houdry Process Corp.) cracks with kaolin in the presence of a volatile acid, such as HCl. According to another Houdry patent, (R. E. Bland, 2,935,461) heavy charge stocks are cracked in a moving bed in the presence of 20-25% steam to prevent catalyst poisoning by metals. Catalytic cracking in the presence of added chlorine or HCl is also described in 2,926,131 (H. J. Hepp and L. E. Drehman to Phillips Petroleum Co.); increased use of steam in catalytic cracking is further treated in 2,938,856 (G. R. Hettick to Phillips Petroleum Co.).

A zeolite cracking catalyst is disclosed by P. B. Weisz in Socony-Mobil Oil Co.'s 2,950,240. Conversions of heavy oils and two-stage cracking are the subject of two Shell Oil Co. patents (2,944,963, R. A. Wilson; 2,956,003, J. A. Marshall, F. Kunreuther, G. J. Reno and G. E. Rehbein).

S. L. Ruskin (2,953,509 to Union Carbide Co.) cracks over a platinum oxide, vanadium oxide or lead oxide catalyst, while irradiating with gamma rays from a cobalt 60 source.

Thermal Cracking. Production of chemicals and particularly ethylene and propylene is the subject of the few patents in this area. K. Fischer and G. Rummert (2,972,647 to Farbwerke Hoechst) recycle lower hydrocarbons other than ethylene, produced during thermal cracking at 500-1100 C.

Coking. There are only relatively few coking patents this year. Aspects of fluid coking are described in three Esso Res. & Eng. Co. patents (2,959,535 J. W. Brown and W. K. Lewis; 2,937,136 J. F. Moser; and 2,927,073 J. F. Moser and F. B. Johnson). A two-stage heavy oil coking process is discussed in Sun Oil Co.'s 2,943,995 (T. S. Mertes). W. F. Wolff and P. Hill (2,938,852 to Standard Oil Co. Indiana) use rock salt particles in the coking drum, while J. K. McKinley, B. F. Smith and S. P. Dickens (2,953,518 to Texaco) replace coke with calcium oxide as the fluidizing medium in a fluid bed coker. Resulting coke-lime is converted to calcium carbide and acetylene.

Reactor Design. Patents in this area are usually too complex to lend themselves to abstracting. Of several patents issued, two are mentioned here: 2,948,673 (C. E. Hemminger to Esso Res. & Eng. Co.) and 2,968,610 (E. V. Bergstrom to Socony-Mobil Oil Co.).

HYDROGENATION-DEHYDROGENATION. In this section a number of patents are discussed which, while involving hydrogenation or dehydrogenation, are not concerned with reforming or cracking.

A special reactor for the hydrogenation of hydrocarbon fractions is described in Sun Oil Co.'s 2,968,614 (C. H. Brooks and C. L. Thomas). In the same company's 2,952,628 J. V. D. Fear removes metals and other non-hydrocarbons by hydrogenative treatment in a multistep operation.

Hydrogenation is the subject of three Esso Res. & Eng. Co. patents. J. Weikart and R. C. Morbeck (2,926,132) disclose a fluid bed hydrogenation of unsaturates and sulfur compounds. Whole or reduced crude is the feed stock for the hydrogenation process of 2,934,492 (C. E. Hemminger and R. C. Morbeck). Asphalt is hydrogenated according to C. L. Thorpe, R. L. Heinrich, E. J. Hoffman and J. A. Anderson, Jr. (2,950,242).

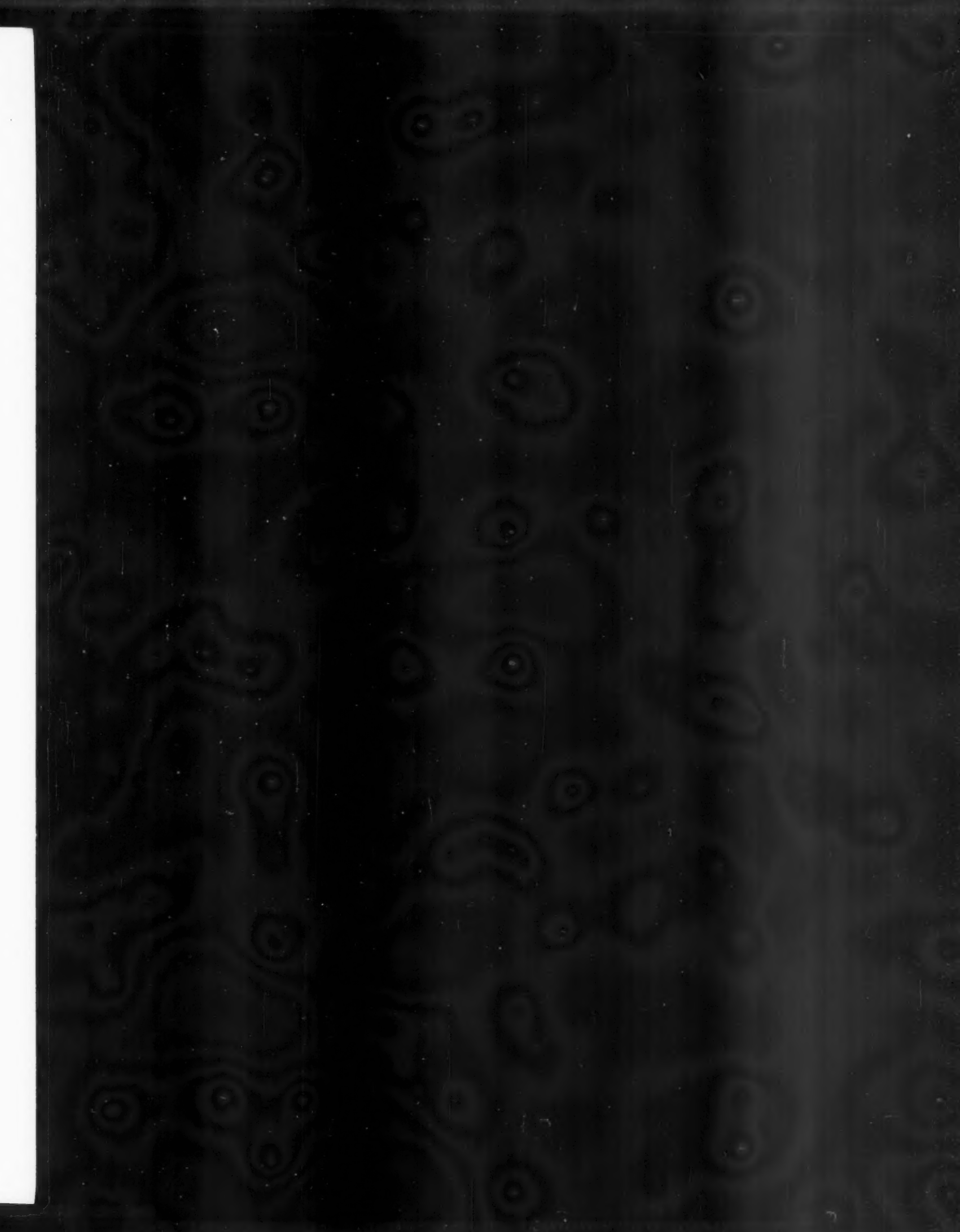
Destructive hydrogenation of heavy cycle oils over fluorine containing cobalt-molybdena-alumina is treated in Shell Oil Co.'s 2,939,836 (J. Koome, G. J. F. Stijntjes and W. K. Meerbott). C. K. Viland (2,934,574 to Tidewater Oil Co.) discusses a selective hydrogenation of butadiene in the presence of butenes.

The preponderance of dehydrogenation patents is concerned with lower molecular weight hydrocarbons and particularly with diolefin production. O. C. Karkalits and H. F. Christmann (2,958,717 to Petro-Tex Chem. Corp.) propose a titania-ferric oxide-potassia catalyst for olefin dehydrogenation in the presence of steam. R. P. Cahn (2,957,928 to Esso Res. & Eng. Co.) presents a flowsheet for a diolefin production process. D. S. Alexander and J. Firko (2,945,900 to Polymer Corp.) improve butene to butadiene dehydrogenation over calcium nickel phosphate by the addition of a trace of oxygen. A special C_4 dehydrogenation catalyst is disclosed in R. P. Sieg's 2,943,067 (to California Research Corp.).

Details of a two-stage dehydrogenation of butane to butadiene are discussed in Phillips Petroleum Co.'s 2,963,522 (J. R. Cobb, Jr.). Houdry Process Corp.'s 2,946,831 (J. B Maerker) is concerned with isoprene production from n-pentane, involving isomerization as well as dehydrogenation.

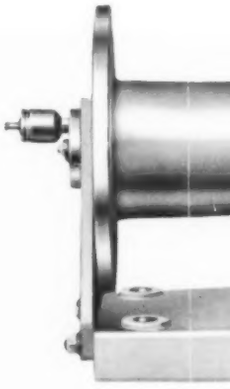
ALKYLATION - DEALKYLATION. The upward trend in activity in this field, which was observed a year ago, has continued. This year, interest in dealkylation processes is obvious. This, of course, has found expression in the recent announcements of several new processes for the production of benzene from toluene and naphthalene from methylnaphthalenes.

Paraffin-Olefin Alkylation. Process improvements in sulfuric acid alkylation and



Portable Air Compressors, Air Motors, Air Winche

" Think big, think safely, think well ahead " summarises the rules that apply to all planners in petroleum . . . to planners and executives at refineries particularly. Compressed air is the safest form of power to use among highly inflammable products. The Holman Group is the largest manufacturer of pneumatic equipment in the British Commonwealth, and 70 per cent. of HOLMAN output is exported. Air compressors, percussive tools, air motors, air winches, submersible pumps and other pneumatic equipment manufactured by HOLMAN have earned a reputation for safety, efficiency, and high performance with low operating and maintenance costs.



ROTAIR Portable Rotary-screw Air Compressors

Over-all efficiency and negligible maintenance costs are important features of ROTAIR compressors. There are no reciprocating parts: vibration is minimised. Positive clearances prevent metal-to-metal contact both between the rotors and the stator casing; which is subject to no wear whatever. ROTAIR models deliver 150, 370, and 600 cu. ft. min. F.A.D. at 100 p.s.i. Stationary models are also available.

Catalogue RO 2

HOLMAN also manufacture portable reciprocating compressors in which detailed attention to valve design, and the use of double-acting differential pistons, contribute to long life and efficiency. The range includes three water-cooled and two air-cooled models with capacities from 120 to 315 cu. ft. min. at 100 p.s.i.

General Catalogue, Section A 2

TRACTAIR and HOLPACK Portable Air Compressors

For on-the-spot manœuvrability, HOLMAN offer a choice of tractor-mounted air compressors. Tractair Models 8 and 13 comprise self-contained HOLMAN two-stage compressor units mounted on Fordson Major tractors and driven from the power take-off shaft. Holpack Air Compressor assemblies are suitable for attaching to tractors which have hydraulic or power-operated lift linkage. The Holpack can be lifted bodily and taken to the work site. If the tractor is required for other work it can be detached in less than two minutes. Tractair and Holpack Models 8 and 13 have outputs of 71·5 cu. ft. min. and 110 cu. ft. min. F.A.D. at 100 p.s.i. respectively.

Leaflets A 5, A 6, A 7, A 8 and A 9

air . . . compressed air . . . power . .

nches, etc.

HOLMAN Air Motors and Air Winches

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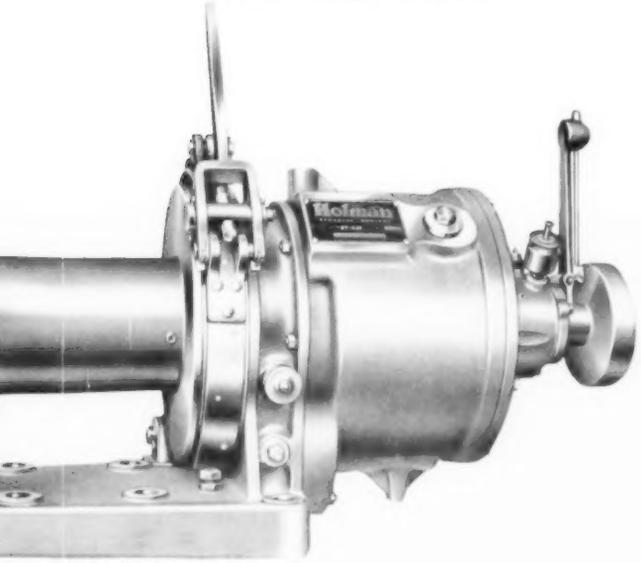
General Catalogue, Section B 1



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General Catalogue, Section K 11

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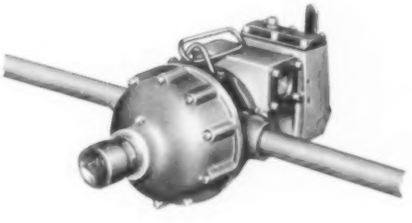

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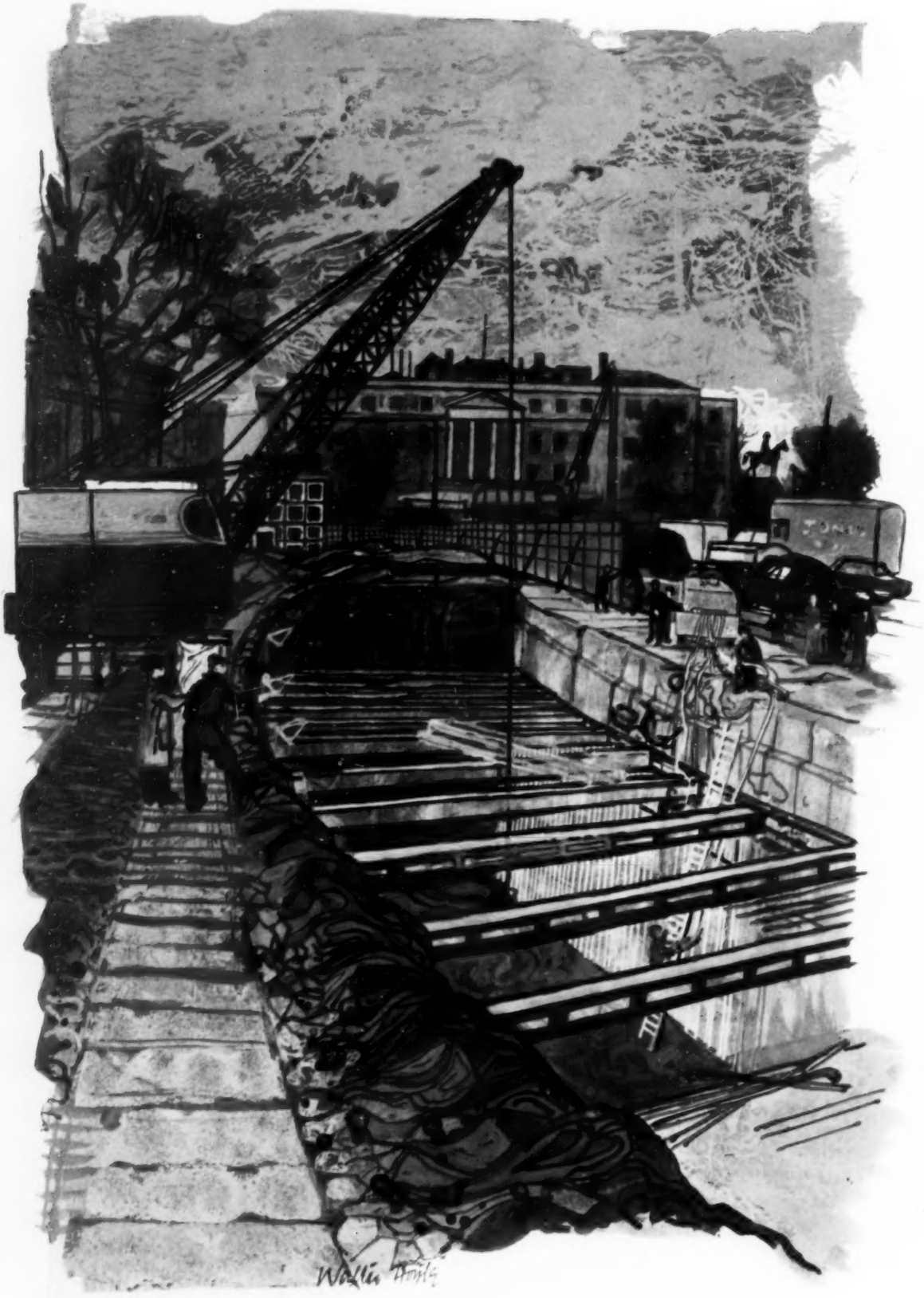

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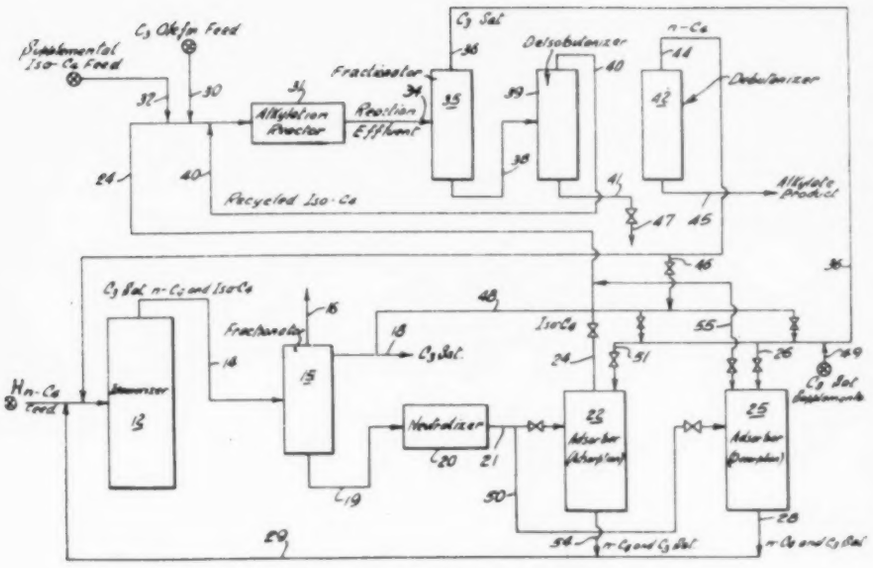

Fig. 2—Flowsheet for alkylation process, USA Patent 2,935,543, R. Smith (to Texaco Inc.)

methods of handling n-butane along with isobutane are discussed by R. Smith in Texaco's 2,935,543 (see Fig. 2) and 2,938,-061. A. Schriesheim, according to Esso Res. & Eng. Co.'s 2,943,126, employs a liquid alkylation catalyst comprising complexes of aluminum bromide and chloride. Aluminum chloride-ether is the catalyst used in an alkylation process disclosed by L. W. Hamilton, Jr. and W. F. Johnston (2,960,-553 to American Oil Co.), while H. M. Knight and E. V. Kirkland in another American Oil Co. patent (2,945,907) alkylate over boron trifluoride and gel alumina, containing zinc fluoborate or copper fluoborate. A catalyst of boria, silica and alumina is claimed in Engelhard Industries' 2,972,642 (W. C. Pfefferle and P. N. Rylander). Alkylation of C_3-C_{10} alkanes with low molecular weight olefins is, according to Sinclair Refining Co.'s 2,972,649 (O. H. Thomas and G. O. Michaels), carried out by vapor phase contact over 0.01-2% platinum on active alumina.

Improvements in the isoparaffin recycle system are described by W. L. Vermilion in Standard Oil Co. Ohio's 2,946,832. F. A. Clauson and D. K. Beavon (2,967,208 to Texaco) operate a two-stage sulfuric acid process. A hydrogen fluoride alkylation process and apparatus is discussed in Phillips Petroleum Co.'s 2,972,648 (M. V. De Lano). Operating features are the subject of 2,947,796 (J. Warburton and S. R. Stiles to The M. W. Kellogg Co.) and 2,949,494 (D. H. Putney to Stratford Engineering Corp.).

Aromatics Alkylation. R. S. Aries alkylates benzene (2,930,819) or toluene (2,-930,820) with propylene over a calcium-free montmorillonite clay, containing a metal oxide. R. P. Cahn and J. M. Naugle (2,943,118 to Esso Res. & Eng. Co.) employ a catalyst, comprising an aluminum chloride-HCl-hydrocarbon sludge in an inert, light saturated hydrocarbon. An aluminum chloride sludge catalyst is also disclosed in Monsanto Chemical Co.'s 2,948,763 (R. D. Ashmore). H. S. Block (2,971,992 to U.O.P.) alkylates with boron trifluoride and describes process improvements.

Preparation of an alkylation catalyst by mixing small amounts of an alkali metal with a tetrahalide of titanium or zirconium and silica or alumina is disclosed in R. C. Wade's 2,951,885 (to Metal Hydrides, Inc.).

Dealkylation. Demethylation over a platinum catalyst in a first and nickel in a second zone, is discussed in Socony-Mobil Oil Co.'s 2,970,954 (G. W. Munns). The reaction is carried out in the presence of hydrogen and an aromatic at 350-750 F. and 50-300 psig. J. Ryer, M. F. Fontaine and H. V. Hess (2,943,120 to Texaco) dealkylate with a zinc oxide-zinc chromite catalyst at 950-1150 F. at 50-5000 psi in the presence of hydrogen. A platinum on silica-alumina catalyst for dealkylation is proposed by P. M. Pitts and W. K. Griesinger (2,931,842 to The Atlantic Refining Co.).

ISOMERIZATION. For the second year in a row, this is one of the most active subjects and one in which most of the major petroleum companies seem to be carrying out research and development projects.

A large proportion of recent isomerization patents deals with various aspects of noble metal catalysis and hydroisomerization. H. S. Bloch and V. Haensel (2,935,545 to U.O.P.) employ a platinum-alumina catalyst in the presence of BF_3 as a promoter. In 2,945,898, G. R. Donaldson (to U.O.P.) discloses a two-stage reaction over a fluorine promoted platinum-alumina at 320-340 C and 250-320 C. U.O.P.'s 2,952,-715 (G. R. Donaldson and F. J. Riedl) is a modification of this operation. Four Pure Oil Co. patents describe paraffin isomerization over impregnated silica-alumina catalysts. O. L. Beber and N. L. Carr (2,939,-897) contact the fluorine containing hydrocarbon stream with Group VIII noble metal on silica-alumina. H. O. Folkins, E. L. Miller and K. E. Lucas (2,943,128 and 2,943,129) isomerize over palladium-silica-alumina, impregnated with aluminum fluoride or zirconium fluoride. Rhodium on silica-alumina is the catalyst disclosed in 2,951,887 (H. O. Folkins, K. E. Lucas and E. L. Miller).

Two Gulf Res. & Dev. Co. patents (2,-944,097, W. C. Starnes and R. C. Zabor; 2,944,098 M. C. Fogle, R. G. Goldthwait, S. J. Kwolek and T. Rice) discuss C_4-C_6 paraffin isomerization over platinum-alumina with alkyl chloride added to the feed. O. H. Thomas, J. Mooi and E. H. Burk in two Sinclair Refining Co. patents (2,952,721 and 2,972,650) employ a beryllia-alumina base containing noble metal and an active halide promoter. A sulfate promoter for a platinum-alumina-halogen catalyst is claimed in Phillips Petroleum Co.'s 2,939,896 (J. W. Myers).

Homogeneous catalysis, involving a platinum or palladium halide solution in a halogenated straight-chain organic acid or in phosphorus oxychloride is proposed for double bond isomerization of straight-chain terminal olefins, according to Standard Oil Co.'s (Ind.) 2,960,550 and 2,960,551 (M. Feller, H. M. Brennan and H. S. Seelig). The same inventors in Standard Oil Co.'s 2,956,094 use alkanesulfonic acids promoted by phosphorus oxychloride as olefin isomerization catalysts.

Paraffin isomerization with aluminum halide catalysts is still an active subject. S. F. Perry in one of several Esso Res. & Eng. Co. patents (2,938,062) controls the hydrogen content of the recycle to an $AlCl_3$-HCl reactor system. Aspects of solid or liquid phase catalysis with $AlBr_3$-$AlCl_3$ catalysts are described in Esso's 2,956,095; 2,956,096; and 2,956,097, D. Schwartz, A. Schriesheim and N. L. Cull). D. Schwartz in 2,963,528 isomerizes C_5-C_7 over $AlBr_3$ in the presence of hydrogen or iodine as cracking inhibitors.

R. A. Findlay (2,974,181 and 2,929,139 to Phillips Petroleum Co.) discloses an $AlCl_3$ reaction system and a method of hydrogen halide recovery from sludge. A Texaco patent (2,935,546, D. K. Beavon, R. D. Kent and E. D. Wurster) reactivates a supported $AlCl_3$ catalyst by intermittent addition of dissolved $AlCl_3$. M. J. Geerts and H. O. Folkins (2,951,889 to The Pure Oil Co.) claim paraffin isomerization with BF_3, HF in the presence of durene as a cracking inhibitor.

Paraffin isomerization catalysts, such as nickel on silica-alumina, containing aluminum phosphate or iron, cobalt or molybdenum oxides are described in Pure Oil Co.'s 2,935,544; 2,943,127 and 2,951,888 (E. L. Miller, H. O. Folkins and N. L. Carr). A metal hydride is used in con-

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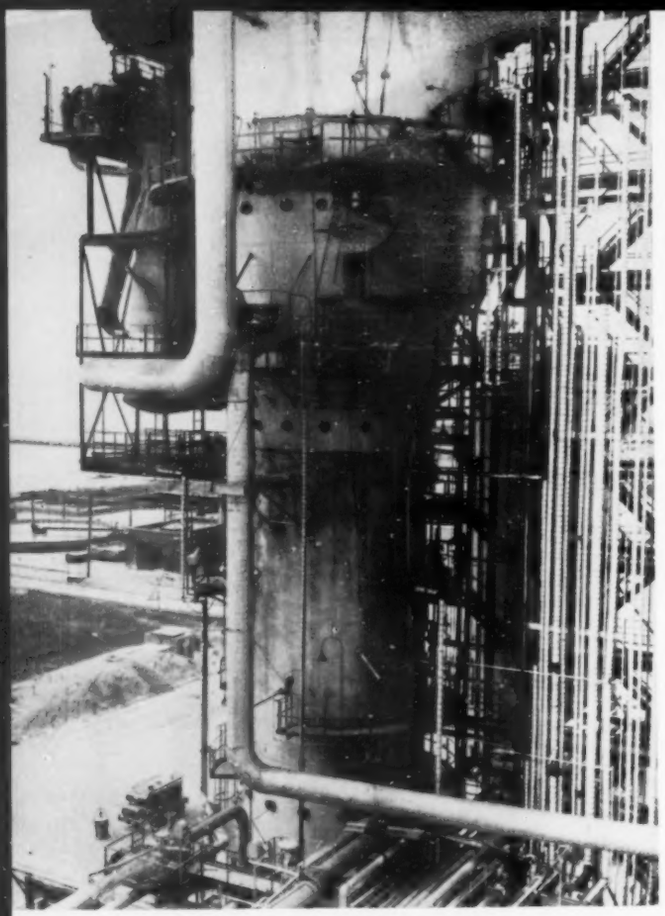
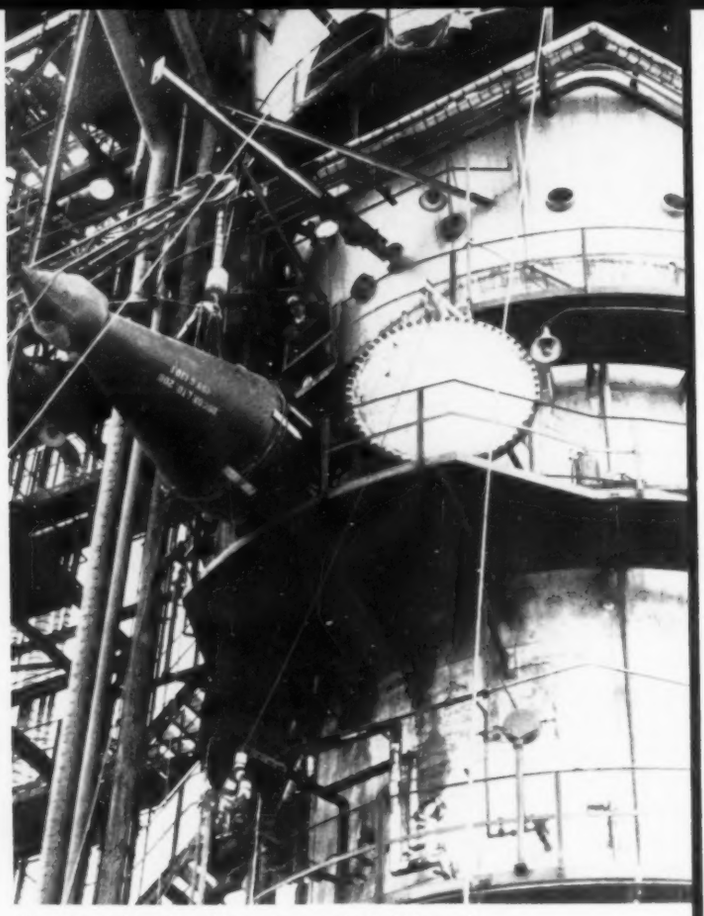


Lower section of the Orthoflow cracking unit, showing scaffolding and working platforms



Moving a cyclone through a manway on the Orthoflow unit

How to revamp a cracking unit during a turnaround

by William C. Uhl
Processing Editor

REVAMP A CATALYTIC cracking unit during turnaround? Admittedly, the job sounds virtually impossible. Yet, with careful planning, split-second scheduling, a high degree of coordination, close communication, some short-cuts and special devices—and a certain amount of just plain good fortune—it has been done. British American Oil Co. Ltd. did it at their Clarkson, Ontario, refinery in the spring of 1959, working jointly with their contractor, Canadian Kellogg Co. Ltd.

The story of how—and why—the project was undertaken begins in 1958 when B-A decided to meet the rising demand for their gasoline in the Canadian market by boosting the capacity of the Orthoflow* fluid unit and associated gas recovery facilities at Clarkson.

British American's problem was this: they needed an engineering plan for a revamp which would provide (1) an immediate capacity increase at minimum cost and least downtime, and (2) provide the groundwork for a further capacity increase at minimum expenditure in the future. Offstream time is most costly when the market forecasts have established the need for increased product volume.

For the solution, the company called on Canadian Kellogg, with whom they had worked on several projects in the past at their various refineries. In September, 1958, C. K. undertook a four-month-long process study which resulted in a plan, approved by B-A, calling for a two-stage revamp.

The first stage—now completed and the subject of this article—called for stepping up the fresh feed rate to the Orthoflow from 11,610 b/sd at 70% conversion to an alternate process design of 18,000 b/sd at 67% conversion or 25,000 b/sd at 50% conversion.

Construction work associated with this first stage was completed during the Clarkson refinery's annual turnaround in the summer of 1959.

The second stage—provided by means of design requirements engineered into the first stage—can take place any time in the future that British American wishes. It would call for raising the fresh feed rate to 25,000 b/sd at 67% conversion or 34,700 b/sd at 50% conversion.

In the 1959 revamp, existing equipment was utilized as far as physically and thermodynamically possible. Very few changes were made to this equipment. For example, the gas recovery section was left virtually untouched. To handle the increased

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Building and delivering big items like the 165-foot-long fractionating tower pictured here is routine performance at Sun Ship. Two towers, each weighing 135 tons and identical with that shown above, were constructed for a petrochemical plant for processing petroleum gases. They were shipped on 9 flatcars. Railroad officials said it was one of the largest shipments ever moved by rail. Because of its length the shipment had to travel a circuitous rail route.

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flow and the desired higher propylene recovery, a second recovery section was added in parallel. Requirements anticipated for the second stage were incorporated into each design change or equipment addition made in the first stage revamp.

The changes were as follows:

(1) The Orthoflow unit reactor cyclones were replaced with new ones and a new lift blower was installed to discharge directly into the riser.

(2) In the fractionator, modifications were made to three trays, a nozzle for the rich oil return was added to tray 9, and the trays in the gas oil stripper were replaced.

The heat recovery system was redesigned to allow for the new flexibility requirements. It was necessary to add a new light cycle oil cooler, top tray reflux cooler, and additional overhead heat transfer surface in parallel with existing exchangers. The existing light gas oil cooler was used to replace the decanted oil cooler. The intermediate reflux boiler went into slurry service to take advantage of the anticipated higher mean temperature differences and to save the purchase of a new boiler. Steam separators were added to the boilers. Some existing turbines were modified to increase horsepower, a few new drivers and pumps were installed, and several existing pump impellers were replaced.

(3) Changes made in the existing gas recovery unit were the addition of a heavy gasoline cooler, moving the existing heavy gasoline cooler to light gasoline service, and some re-piping to accommodate the different heating mediums.

Tail gas from the secondary absorber flows to a new secondary absorber for recovery of lean oil loss and further pick-up of C_3 and C_4.

(4) One half of the interstage gas is compressed in a reciprocating machine as feed for the new gas recovery unit. All the liquid is charged to a new absorber-stripper along with the extraneous feed from the crude still and reforming units. Lean oil for the absorber-stripper column is transferred from the existing secondary absorber bottom by a new pump. The absorber and the stripper are separated by a solid head to provide recontacting and cooling of stripper vapors with incoming feed. However, to reduce investment cost, the piping, drum, and extra heat transfer surface were not installed at this time.

Gas from the new absorber-stripper and existing secondary absorber is charged to a new secondary absorber. Lean oil is unstripped light cycle oil. The "absorbed gas" is recycled through the fractionator. The tower must be operated at low pressure so that gas from the existing unit can be processed.

The new unit was designed in conjunction with the existing unit to recover 99.5% C_4's. Sufficient C_2's are stripped to fuel gas so that LPG vapor pressure specifications can be met on the C_3 stream after catalytic polymerization. The propylene recovery is in excess of 80%.

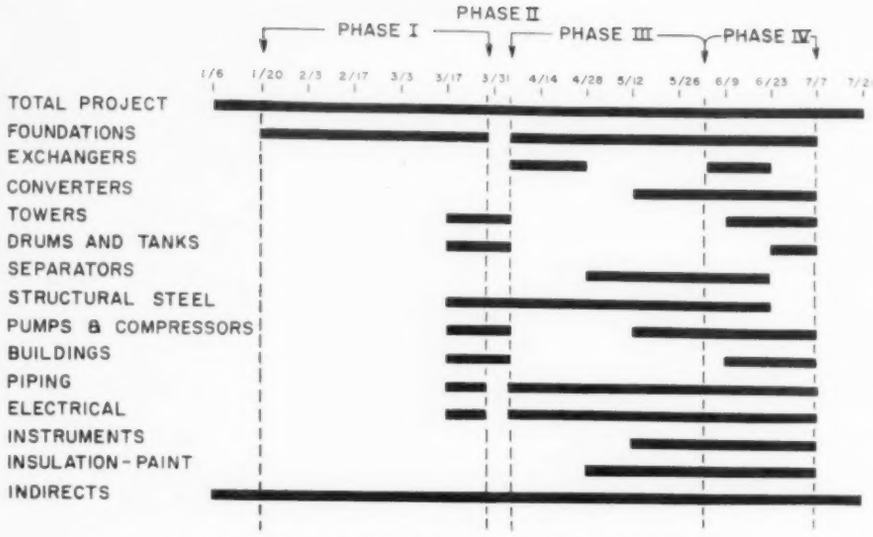

Fig. 1—Overall work schedule shows how various parts of project were carefully planned. Phase I was the preparation for "button-up" shutdown. Phase II was the actual "button-up." Phase III, preparation for main shutdown, and Phase IV was the main shutdown

Construction work for the project was broken down into four phases, as illustrated in the progress bar chart in Fig. 1.

Phase I, the preparation for the "button-up" shutdown, ran from January 20 through March 23, 1959. Phase II, the button-up shutdown, ended one week later, April 1. Phase III, the preparation for the main shutdown, ended May 31, and Phase IV, the actual main shutdown, was completed July 5, five weeks later. At that date, the project was virtually complete, and all work was finished by July 21. The scheduling of all four phases took into account no days lost due to situations over which there was no control, such as weather, labor disputes, and the like.

Phase I work was concerned primarily with the installation of foundations. Conflicting underground piping and electrical conduit had been cut off during a previous shutdown so that excavation work could move ahead rapidly with no delays. During the last two weeks of the first phase, structural work was started on towers, drums and buildings, some steel was erected, and a small amount of electrical equipment, pumps, and piping was installed.

The actual work involved in Phase II was accomplished in a four-day period, during a preliminary "button-up" shutdown while the Orthoflow unit was still under pressure. It included (1) erection of strippers and drums plus bolting on preassembled steel platforms to the towers, (2) erection of the compressor shelter steel, (3) setting the booster gas compressor on its foundation, and (4) setting the lift air blower and turbine drive on its foundation.

Major activities during Phase III, the preparation for the main shutdown, included carrying foundation work and erection of structural steel well toward completion, and getting about one-third of the piping and over half the electrical installations into place. Particular attention was paid to finishing underground work. Work also moved along rapidly on exchangers, separators, instruments, and pumps and compressors. Phase III also saw the virtual completion of the installation of the new gas recovery unit, up to but not including the final tie-ins. This meant that all testing, insulation, and painting of new equipment was completed prior to Phase IV, and only the work associated with existing operating equipment and the tie-ins were left for the final period.

Wherever possible, steel underground lines were fabricated in the field in the largest subassembly possible (outside the area) so as to minimize field welds. Underground piping and conduit lines were completed, tested, and then the area was backfilled. No piping tie-ins to existing lines could be made during this phase.

Phase IV was the essential completion of the project, during the main five week unit shutdown. Before it started, the process unit was completely steamed out and all pipe lines were drained, including water lines both above and below ground.

The key to the successful completion of the job was, of course, the careful planning and the close coordination and communication between the refinery and the contractor, especially during the critical last phase. For example, copies of detailed work orders—which covered work on an hour-by-hour basis—were distributed several weeks before actual use not only to the higher level supervisors but also to all job foremen, safety engineers, etc., of both parties concerned.

These work orders permitted considerable flexibility. For example, everyone on the job became thoroughly familiar with the scope and complexity of the project. And, with the knowledge of exactly what would

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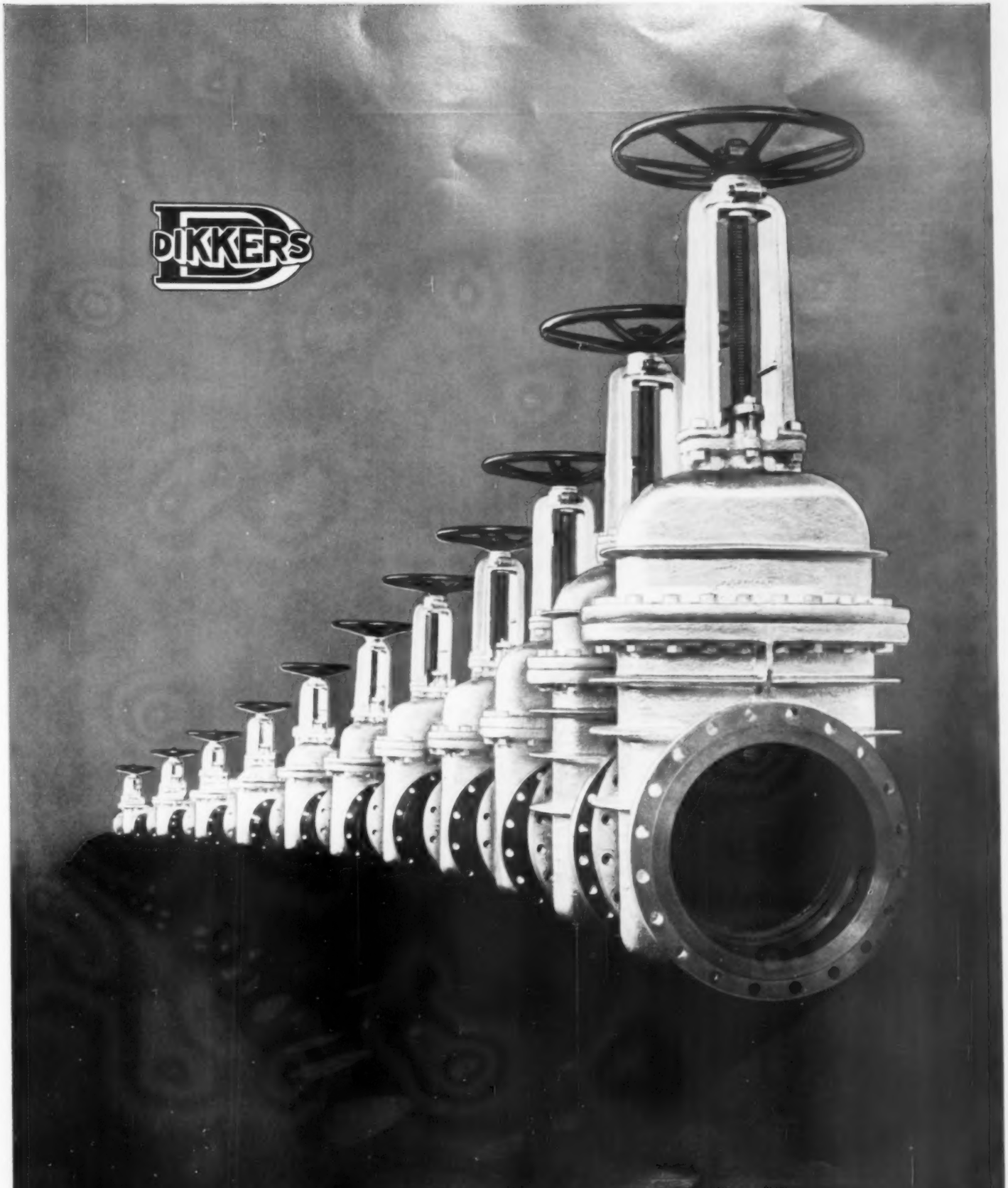

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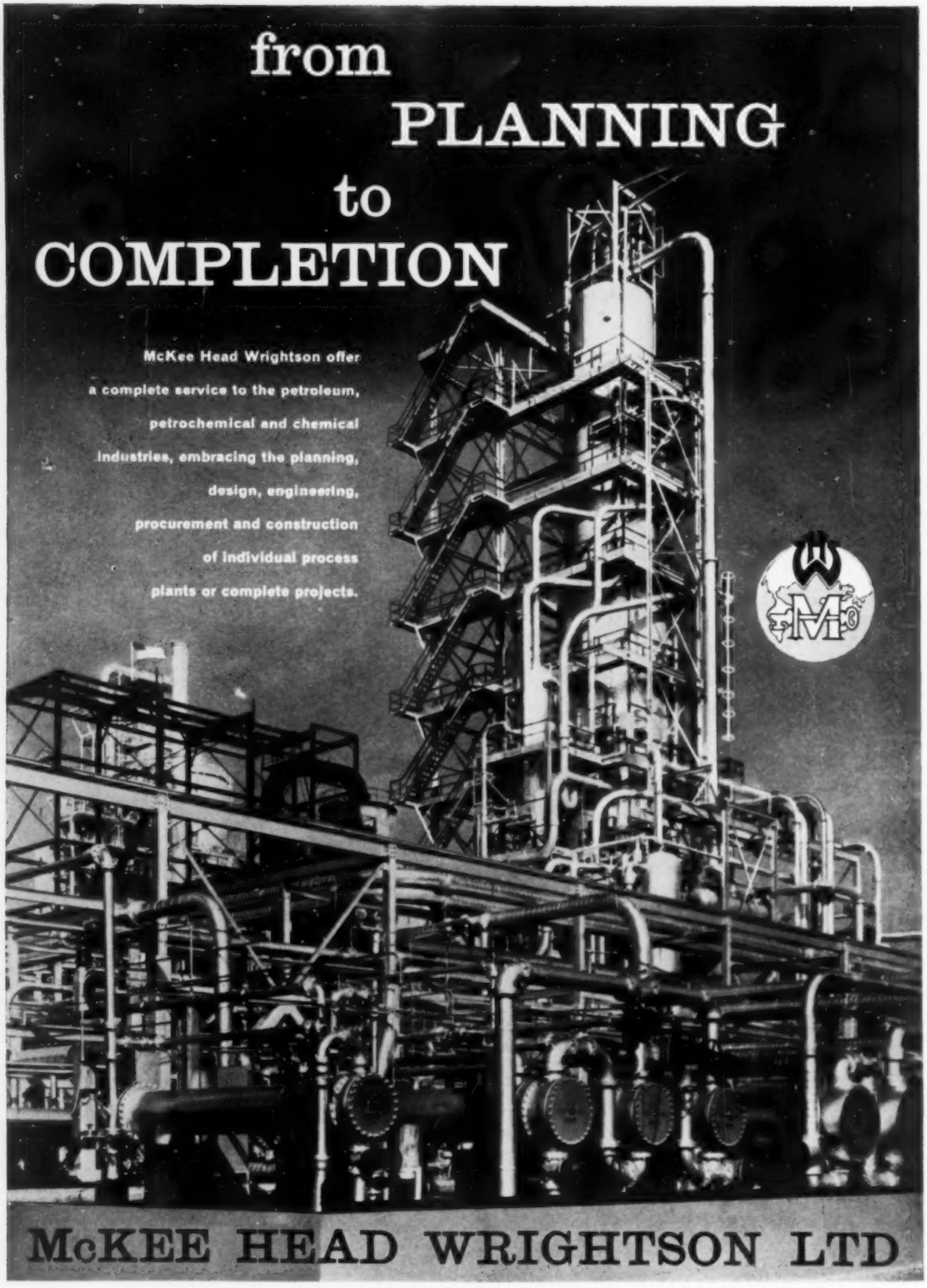

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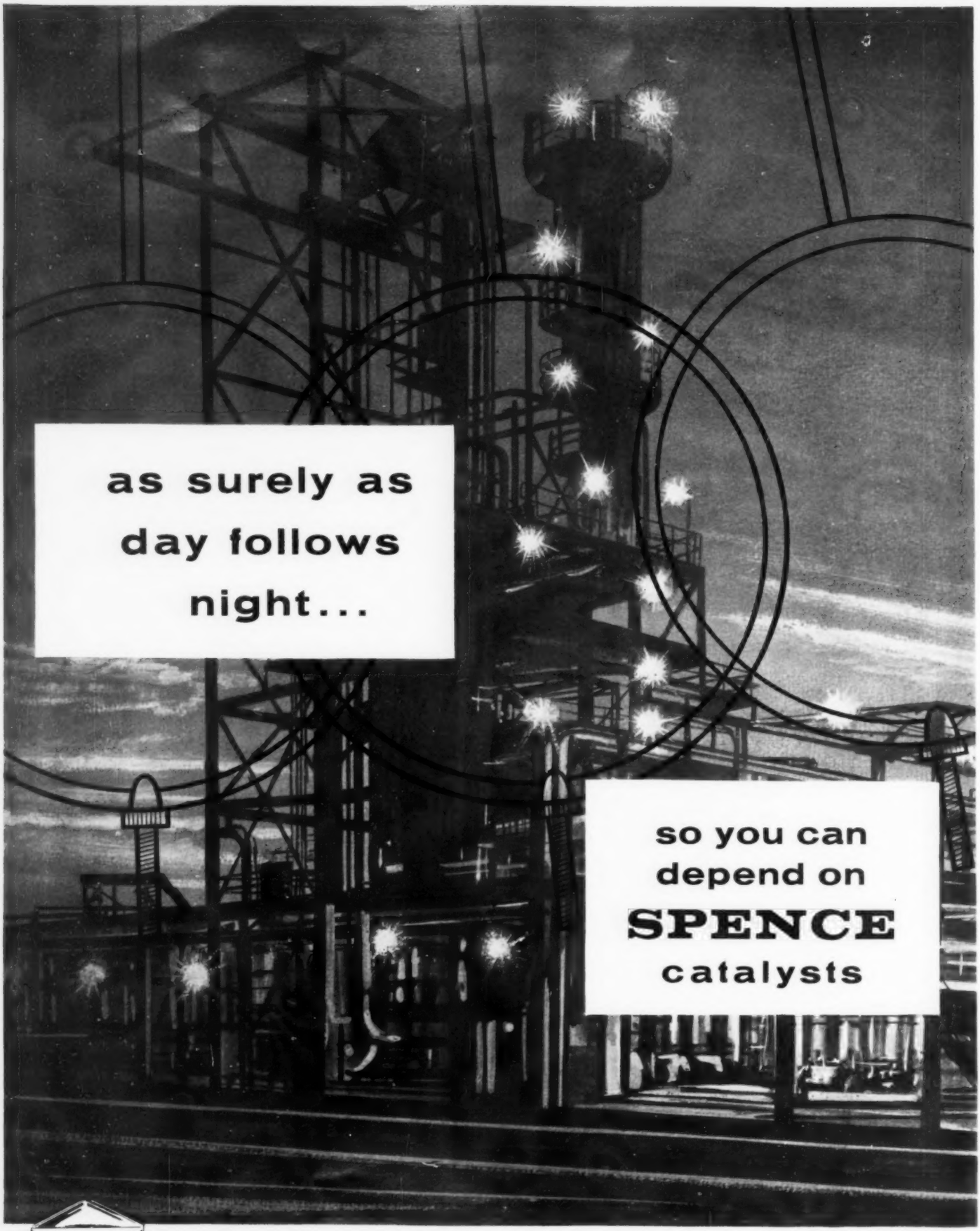
TEXACO: SYMBOL OF WORLD-WIDE PROGRESS THROUGH PETROLEUM



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L I L

The world's processing plants

BEGINNING on this page, the editors of WORLD PETROLEUM are pleased to present a complete directory of the world's petroleum refineries and the world's petrochemical plants.

Included are all facilities—presently operating, planned or under construction — in all countries outside the USA but including USSR and other communist nations where reliable information was obtainable.

The first section, starting on this page, is on refineries. Immediately following it are the petrochemical plants. For convenience, listing is alphabetical by company name under each specific country. Countries are grouped into major geographical areas and also arranged alphabetically.

North America

Canada

ANGLO AMERICAN EXPLORATION LTD. Hartell, Alberta. General superintendent, C. K. Carr.

Crude capacity: 4,000 b/sd. Vacuum distillation, 400 b/sd. Thermal cracking, 1,400 b/sd. Atlantic Catforming, 1,000 b/sd, with sulfur removal. Polymerization, 60 b/sd. Perco liquid copper treating, 1,200 b/sd.

ANGLO-CANADIAN OILS LTD. Brandon, Manitoba. Vice President and refinery manager, A. C. Morrison.

Crude capacity: 3,100 b/d. Thermal cracking, 1,400 b/d. Platforming, 1,000 b/d. Polymerization, 50 b/d. Caustic wash. Inhibitor sweetening.

BRITISH AMERICAN OIL CO. LTD. Calgary, Alberta. Manager, M. T. Stevens.

Crude capacity: 10,000 b/sd. Vacuum distillation, 2,500 b/sd. Thermal cracking, 2,500 b/sd. Atlantic Catforming, 3,000 b/sd. Naphtha desulfurization, 3,500 b/d. Tannin Solutizer, Doctor treating, caustic washing. Asphalt, 600 b/sd (str. run) and 300 b/sd (oxidation).

BRITISH AMERICAN OIL CO. LTD. Clarkson, Ont. Manager, W. E. Lundie.

Crude capacity: 61,500 b/sd. Vacuum distillation, 20,000 b/sd. Thermal cracking, 4,500 b/sd. Orthoflow Model B catalytic cracking, 18,000 b/sd (fresh feed). Atlantic Catforming, 10,000 b/sd. Hydrodesulfurization, 12,000 b/sd. Polymerization, 1,260 b/sd. Distillate desulfurization, 8,000 b/sd. Alkylation, 3,000 b/sd. Caustic treating. Clay contacting. Salt drying of distillate. Lubes, 1,220 b/sd. Asphalt, 4,000 b/sd (str. run) and 1,300 b/sd. (oxid).

Construction: $1 million carbon monoxide boiler and extraction steam turbine, for completion this fall. Boiler capacity: 165,000 lb/hr at 600 psig and 750 F; turbine, 6,000 hp. Contractors: Combustion Engineering, Inc. and Canadian Westinghouse Co. Ltd.

BRITISH AMERICAN OIL CO. LTD. Edmonton, Alberta. Manager, R. E. Harris.

Crude capacity: 8,500 b/sd. Thermal cracking, 2,500 b/sd. Delayed coking, 2,100 b/sd (65 ton/day). Model A Orthoflow catalytic cracking, 2,000 b/sd. Atlantic Catforming, 6,300 b/sd. Desulfurization, 6,300 b/sd. Bauxite treating (kerosine), 500 b/sd.

BRITISH AMERICAN OIL CO. LTD. Montreal East, Que. Manager, J. A. McHardy.

Crude capacity: 50,000 b/sd. Vacuum distillation, 17,000 b/sd. Decarbonizing, 5,500 b/sd. Fluid catalytic cracking, 22,000 b/sd. Atlantic Catforming, 13,000 b/sd plus hydrodesulfurization, 17,000 b/sd. Polymerization, 630 b/sd. Asphalt, 9,000 b/sd (str. run) and 3,000 b/sd oxidation. Lubes, 330 b/sd.

BRITISH AMERICAN OIL CO. LTD. Moose Jaw, Saskatchewan. Manager, B. A. Barnhill.

Crude capacity: 15,000 b/sd. Vacuum distillation, 5,500 b/sd. Thermal cracking, 1,500 b/sd. Delayed coking, 2,250 b/sd (100 ton/day). UOP Fluid catalytic cracking, 4,500 b/sd. Atlantic Catforming, 5,400 b/sd. Hydrodesulfurization, 6,500 b/sd. Polymerization, 390 b/sd. Caustic washing. Salt drying of distillate. Asphalt, 1,200 b/sd.

BRITISH AMERICAN OIL CO. LTD. Port Moody, British Columbia. Manager, C. W. Coote.

Crude capacity: 20,000 b/sd. Vacuum distillation, 9,000 b/sd. Model B Orthoflow catalytic cracking, 9,000 b/sd. Sinclair-Baker catalytic reforming, 4,000 b/sd plus hydrodesulfurization, 7,200 b/sd. Sulfuric acid alkylation, 1,050 b/sd. Distillate desulfurization, 4,000 b/sd. Caustic wash. Petreco electrical caustic wash.

BRITISH AMERICAN OIL CO. LTD. has indicated long range plans for a new refinery in Nova Scotia, with completion probably late in the 1960's.

BRITISH PETROLEUM CANADA LTD. Ville d'Anjou, near Montreal, Que. General manager, J. MacWilliam.

Crude capacity: 25,000 b/sd. Vacuum distillation, 10,000 b/d. Fluid catalytic cracking, 9,000 b/sd. Platforming, 6,000 b/sd. Desulfurization (distillate), 12,000 b/sd. Polymerization, 800 b/sd. Treating (amine, copper chloride and caustic).

CANADIAN HUSKY OIL LTD. Fort William, Ont. Superintendent, F. D. Stevens.

Crude capacity: 3,800 b/sd. Vacuum distillation, 1,300 b/sd. Atlantic Catforming, 1,000 b/sd. Diesulforming (middle distillate), 1,000 b/sd. Asphalt, 820 b/sd.

CANADIAN HUSKY OIL LTD. Lloydminster, Alberta. Superintendent, L. W. Cavanagh.

Crude capacity: 8,500 b/sd. Vacuum distillation, 2,100 b/sd. Cycloversion reforming, 400 b/sd. Desulfurization, 1,000 b/sd. Asphalt, 3,200 b/sd (str. run), 900 b/sd oxidation.

CANADIAN HUSKY OIL LTD. Moose Jaw, Saskatchewan. Superintendent, R. L. Miller.

Crude capacity: 3,200 b/sd. Vacuum distillation, 1,300 b/sd. Atlantic Catforming, 650 b/sd. Visbreaking, 1,300 b/sd. Diesulforming, 1,000 b/sd. Asphalt, 800 b/sd (str. run), 220 b/sd oxidation.

CANADIAN KODIAK REFINERIES LTD. Lloydminster, Alberta. General manager, E. P. Agnew.

Crude capacity: 4,000 b/d. Vacuum distillation, 2,350 b/d. Asphalt oxidation, 2,000 b/d. Petreco dehydrating and desalting

Construction plans include production of jet fuel using hydrogen from gas condensate treatment to treat black oil overhead and desulfurize end product.

CANADIAN OIL COS. LTD. Corunna, near Sarnia, Ontario. Manager, V. M. Norwood.

Crude capacity: 50,000 b/sd. Vacuum distillation, 20,000 b/sd. Visbreaking, 3,500 b/sd. Orthoflow catalytic cracking, 12,000 b/sd (fresh feed). Platforming for motor fuel, 6,000 b/sd (4,500 b/sd for Udex extraction). Polymerization, 2,000 b/sd (feed), 700 b/d (products). Unifining, 5,000 b/d. Merox and Doctor treating. Caustic washing.

CANADIAN OIL COS. LTD. Innisfail field, near Red Deer, Alberta. Manager, Reg. Humphrey.

Capacity: 5,000 b/d (of gas condensate) and up to 2,000 b/d crude oil. Platforming, 1,850 b/d. Unifining, 1,850 b/d (naphtha). Caustic scrubbing. Merox treating.

New $4 million plant completed in October, 1960. Contractor was Canadian Bechtel Ltd.

CANADIAN PETROFINA LTD. Pointe-aux-Trembles, near Montreal, Quebec. Superintendent, J. F. Mills.

Crude capacity: 30,000 b/d. Vacuum distillation, 14,500 b/d. Fluid coking, 3,800 b/d (80 ton/day). Houdriflow catalytic cracking, 12,000 b/d (fresh feed). Ultraforming, 4,500 b/d. Polymerization, 450 b/d. Sulfuric acid alkylation, 1,500 b/d. Shell Trickle hydrodesulfurization (fuel oil), 4,000 b/d. Hydrofining, 4,500 b/d. Linde gasoline treating. Asphalt, 2,500 b/d.

CITIES SERVICE REFINING LTD. CANADA. Bronte, Ontario. Superintendent operations, W. R. Jacoby.

Crude capacity: 20,000 b/d. Vacuum distillation, 8,200 b/d. UOP Fluid catalytic cracking, 7,000 b/d. Sinclair-Baker catalytic reforming and hydrodesulfurization, 3,500 b/d. Distillate hydrodesulfurization, 4,000 b/sd. Bender sweetening. Caustic treating. Amine treating.

Dist. hydrodesulfurization unit was completed in April at cost of $1 million. Contractor was Procon.

CONSUMERS' COOPERATIVE REFINERIES LTD. Regina, Saskatchewan. Manager, B. W. Pawson.

Crude capacity: 16,000 b/sd. Vacuum distillation, 6,500 b/sd. Delayed coking, 3,000 b/sd (145 ton/day). UOP Fluid catalytic cracking, 7,000 b/sd. Platforming-Unifining, 3,000 b/d. Middle distillate Unifining, 6,000 b/d. Polymerization, 750 b/sd. Treating (caustic, Perco, Doctor).

Under construction: Crude capacity increase to 22,500 b/sd, cost $375,000; and catalytic cracking is being raised to 16,000 b/d. Completion date, November. Contractor: The Refinery Engineering Co. of Calgary.

GOLDEN EAGLE REFINING CO. OF CANADA LTD., a wholly owned subsidiary of Ultramar Co. of the UK, is constructing a 7,500 b/sd refinery at Holyrood, Newfoundland, which is to include a distillate desulfurizer and a catalytic reformer. Production target is about 1,000 b/sd gasolines, 2,000 b/sd kerosene and heating oils, and 4,500 b/d heavy fuel oils and asphaltic bottoms. H. R. Fifer is executive vice president. Plant will operate on Venezuelan crude.

IMPERIAL OIL LTD. Calgary, Alberta. Manager, S. T. Reynolds.

Crude capacity: 14,700 b/d. Vacuum distillation, 6,100 b/d. Model IV Fluid catalytic cracking, 7,000 b/d. Powerforming, 3,000 b/d. Naphtha hydrofining, 2,700 b/d. Sulfuric acid alkylation, 870 b/d. Treating. Asphalt, 725 b/d.

IMPERIAL OIL LTD. Edmonton, Alberta. Manager, E. K. Lewis.

Crude capacity: 28,500 b/d. Vacuum distillation, 13,000 b/d. Thermal cracking, 4,600 b/d. Model IV Fluid catalytic cracking, 8,000 b/d. Powerforming, 2,000 b/d. Hydrofining, 2,700 b/d. HF alkylation, 1,500 b/sd. Lubes, 2,000 b/d. Asphalt, 1,500 b/d.

IMPERIAL OIL LTD. Halifax, Nova Scotia. Manager, M. MacLeod.

Crude capacity: 49,000 b/d. Vacuum distillation, 25,000 b/d. Model IV Fluid catalytic cracking, 17,000 b/d. Powerforming, 6,300 b/d. Hydrofining, 4,900 b/d. Polymerization, 4,500 b/d (feed), 2,000 b/d (products). Asphalt, 1,850 b/d.

IMPERIAL OIL LTD. Ioco, British Columbia. Manager, Harry L. Cavanagh.

Crude capacity: 32,000 b/d. Vacuum distillation, 15,200 b/d. Model IV Fluid catalytic cracking, 9,000 b/d. Powerforming, 5,000 b/d. Polymerization, 2,340 b/d (feed), 1,125 b/d (products). Hydrofining, 3,850 b/d. Asphalt, 1,370 b/d. Treating (lye, Doctor, Potasol).

IMPERIAL OIL LTD. Montreal East, Quebec. Manager, J. J. Rowan.

Crude capacity: 71,800 b/d. Vacuum distillation, 40,800 b/d. Model IV Fluid catalytic cracking, 20,900 b/d. Powerforming, 8,400 b/d. Visbreaking, 10,500 b/d. Polymerization, 5,000 b/d (feed), 2,300 b/d (products). Hydrofining, 7,000 b/d. Asphalt, 4,650 b/d. Treating.

IMPERIAL OIL LTD. Norman Wells, North West Territories. Manager, J. S. L. McMillan.

Crude capacity: 1,500 b/d. Products: aviation and motor gasolines, middle distillates, fuel oils.

IMPERIAL OIL LTD. Regina, Saskatchewan. Manager, A. Garfield Stewart.

Crude capacity: 22,500 b/d. Vacuum distillation, 10,700 b/d. Thermal cracking, 4,500 b/d. Model IV Fluid catalytic cracking, 8,500 b/d. Powerforming, 3,000 b/d. Polymerization, 2,000 b/d (feed), 1,000 b/d (products). Asphalt, 550 b/d. Treating (caustic, copper chloride, Doctor).

IMPERIAL OIL LTD. Sarnia, Ontario. Manager, W. J. Beynon.

Crude capacity: 94,500 b/d. Vacuum distillation, 26,500 b/d. Thermal cracking, 4,000 b/d. Thermal reforming, 8,000 b/d. Delayed coking, 28,000 b/d (150 ton/day). Model IV Fluid catalytic cracking, 22,000 b/d. Powerforming, 13,500 b/d. Visbreaking, 4,000 b/d. Alkylation, 1,500 b/d. Asphalt, 2,300 b/d. Hydrofining, 3,800 b/d. Caustic, copper chloride and Doctor treating. Lubes, 3,200 b/d.

Under construction: A 32,000 b/d hydrofiner for furnace oils.

IMPERIAL OIL LTD. Winnipeg, Manitoba. Manager, H. F. Wheaton.

Crude capacity: 18,000 b/d. Vacuum distillation, 7,300 b/d. Model IV Fluid catalytic cracking, 6,500 b/d. Powerforming, 2,700 b/d. Hydrofining, 2,500 b/d. HF alkylation, 650 b/sd. Asphalt, 1,100 b/d. Treating processes.

IRVING REFINING LTD. St. John, New Brunswick. President, Lee C. Henning; refinery manager, W. R. Forsythe.

Crude capacity: 40,000 b/d. Fluid catalytic cracking, 13,000 b/d. Catalytic reforming, 7,200 b/d. Hydrodesulfurization, 5,000 b/d. Hydrotreating, 2,500 b/d. Hydrogen manufacture, approx. 3 mmcf/d.

NEW BRUNSWICK OILFIELDS LTD. Weldon, New Brunswick. Superintendent, C. W. Fales.

Crude capacity: 300 b/d. Products, gasoline and fuel oils.

NORTH STAR OIL LTD. Grande Prairie, Alberta. Superintendent, W. Campbell.

Crude capacity: 2,500 b/d. Thermal cracking, 900 b/d. Sinclair-Baker catalytic reforming, 850 b/d. Naphtha desulfurization, 850 b/d. Linde treating, 1,000 b/d.

NORTH STAR OIL LTD. St. Boniface, near Winnipeg, Manitoba. Manager, W. J. Dubesky.

Crude capacity: 12,000 b/sd. Vacuum distillation, 4,860 b/sd. Model B Orthoflow catalytic cracking, 5,200 b/sd. Platforming, 2,700 b/sd. Unifining (naphtha), 2,700 b/sd. Polymerization, 390 b/sd. Merox treating (naphtha) 2,200 b/sd. Caustic washing.

NORTHERN PETROLEUM CORP. LTD. Kamsack, Saskatchewan. General manager, B. F. Webster.

Crude capacity: 1,000 b/sd. Vacuum distillation, 400 b/sd. Treating (caustic and copper chloride). Asphalt, 300 b/d.

PACIFIC PETROLEUMS LTD. Taylor, British Columbia. Superintendent, S. D. Lathrop.

Crude capacity: 2,000 b/sd. UOP catalytic cracking, 1,700 b/sd. Platforming, 2,000 b/sd. Perco HF alkylation, 800 b/sd. Unifining, 3,500 b/sd (mostly gas condensate). Inhibitor treat. Caustic wash.

REGENT REFINING (CANADA) LTD. Port Credit, Ontario. Superintendent, L. W. Kennedy.

Crude capacity: 26,000 b/d. Vacuum distillation, 8,000 b/d. UOP Fluid catalytic cracking, 7,000 b/d. Platforming, 5,200 b/d. Naphtha hydrotreating, 5,200 b/d. Polymerization, 660 b/d. Visbreaking, 3,600 b/d. Doctor and inhibitor sweetening. Caustic wash.

Under construction: $2 million UOP aromatics extraction unit (3.5 million gal/yr). Contractor: Canadian Bechtel Ltd.

ROYALITE HI-WAY LTD. Saskatoon, Saskatchewan. Superintendent, J. C. Browning.

Crude capacity: 8,000 b/d. Vacuum visbreaker, 3,780 b/d. Thermal cracking, 1,600 b/d (feed), 250 b/d (products). Perco desulfurization, 2,000 b/d. Merox treating, 500 b/sd. Caustic wash and inhibitor sweetening. Asphalt, 500 b/d.

ROYALITE OIL CO. LTD. Kamloops, British Columbia. Superintendent, J. Wach.

Crude capacity: 5,000 b/d. Vacuum distillation, 2,180 b/sd. UOP Fluid catalytic cracking, 1,400 b/d. Platforming, 1,000 b/d. Polymerization, 100 b/d. Asphalt, 700 b/d.

SHELL OIL CO. OF CANADA LTD. Montreal East, Quebec. Manager, G. A. Lorenz.

Crude capacity: 63,000 b/sd. Vacuum distillation, 33,000 b/sd. Thermal cracking, 7,000 b/sd. Visbreaking, 7,500 b/sd. Fluid catalytic cracking, 23,500 b/sd. Platforming, 8,300 b/sd. Polymerization, 3,600 b/sd (feed), 1,200 b/d (products). HF alkylation, 1,500 b/sd. Shell Trickle hydrodesulfurization, 9,000 b/sd (cat cracker feed). Similar unit for middle distillate, 22,000 b/sd. Linde treating, 8,000 b/sd. Solutizer, 14,000 b/sd. Asphalt, 6,000 b/sd.

SHELL OIL CO OF CANADA LTD. North Burnaby, British Columbia. Manager, A. C. Hogge.

Crude capacity: 20,000 b/d. Vacuum distillation, 8,000 b/d. Thermal cracking, 4,500 b/d. UOP Fluid catalytic cracking, 6,000 b/d (fresh feed). Platforming, 3,300 b/d. Polymerization, 400 b/d. Unifining, 3,300 b/d. Solvent and specialties unit, 1,000 b/d. Shell hydrodesulfurization (distillates), 9,300 b/d. Doctor treating (cat cracked gasoline), 3,000 b/d. Air solutizer (str. run gasoline), 3,500 b/d. Asphalt 2,000 b/d.

SHELL OIL CO. OF CANADA LTD. has purchased property near Bronte, Ontario. No definite plans have been announced, but a new 20,000 b/d refinery is being considered as a possibility for 1962-63.

SHELL OIL CO. OF CANADA LTD. has taken an option on 310 acres near Calgary, Alta. for the possible construction of a new refinery. No further information has been disclosed.

STANDARD OIL CO. OF BRITISH COLUMBIA LTD. North Burnaby, British Columbia. Manager, T. S. Bremner.

Crude capacity: 18,900 b/sd. Vacuum distillation, 8,000 b/sd. Model IV Fluid catalytic cracking, 5,000 b/sd (fresh feed). Platforming, 3,000 b/d. Polymerization, 450 b/sd. (products). Copper chloride and caustic washing. Asphalt, 2,000 b/d.

SUN OIL CO. LTD. Sarnia, Ontario. Manager, F. A. Bain.

Crude capacity: 18,000 b/d. Houdriflow catalytic cracking, 11,500 b/d. Houdriforming, 3,000 b/d. Visbreaker, 3,300 b/d. Perco kerosene sweetening, 2,000 b/d. Caustic wash for gasoline with Howe-Baker electric coalescer.

New construction: 2,600 b/d, $700,000 heating oil hydrodesulfurizer, completed in May. Contractor: Catalytic Construction of Canada Ltd.

SUPERTEST PETROLEUM CORP. LTD. is reportedly considering a new refinery of undisclosed capacity at London, Ontario.

TEXACO CANADA LTD. Edmonton, Alberta. Superintendent, H. M. Williams.

Crude capacity: 12,000 b/d. Delayed coking, 2,000 b/d (60 ton/day). Thermal cracking, 2,700 b/d. Fluid catalytic cracking, 4,000 b/d. Platforming, 3,000 b/d. Polymerization, 750 b/d (feed), and 250 b/d (product). Linde treating.

TEXACO CANADA LTD. Montreal East, Quebec. Superintendent, H. M. Bolitho.

Crude capacity: 59,000 b/d. Vacuum distillation, 30,000 b/d. Visbreaking, 13,000 b/d. Fluid catalytic cracking, 20,000 b/d. Platforming, 11,000 b/sd. Polymerization, 4,500 b/d (feed), 1,500 b/d (products). Distillate hydrotreating, 11,900 b/d. Linde treating, 24,200 b/d. Sulfuric acid alkylation, 2,000 b/d.

WAINWRIGHT PRODUCERS & REFINERS LTD. Wainwright, Alberta. General manager, R. A. Stewart.

Crude capacity: 4,500 b/d. Vacuum distillation, 2,500 b/d. Thermal cracking, 800 b/d. Coking, 1,000 b/d. Treating (Doctor, caustic wash, and salt drying of distillate).

Construction: new 1,200 b/d asphalt unit.

X-L REFINERIES LTD. Dawson Creek, British Columbia.

This refinery was closed down for good in April. All products now being manufactured by Pacific Petroleum at the newer Taylor, B.C., refinery. Dawson Creek is to be operated as a bulk plant only.

Mexico

PETROLEOS MEXICANOS. Arbol Grande, Tampico. Plant Manager, J. B. Aguilar.

Crude capacity: 5,000 b/d. Grease manufacture. Plant being dismantled.

PETROLEOS MEXICANOS. Atzcapotzalco, Mexico City.

Crude capacity: 100,000 b/d. Vacuum distillation, 60,000 b/d. Visbreaking, 25,000 b/d. Model IV Fluid catalytic cracking, 30,000 b/d. Alkylation, 3,000 b/d. Desulfurization, 29,000 b/d. Polymerization, 800 b/d.

PETROLEOS MEXICANOS. "Madero" refinery, Tampico. Gen'l Ref'y. sup't, Francisco L. Corcuera.

Crude capacity: 125,000 b/d. Vacuum distillation, 60,000 b/d. Visbreaking, 8,000 b/d. Fluid catalytic cracking, 30,000 b/d. Perco Cycloversion, 15,000 b/d. Perco desulfurization, 18,000 b/d. Polymerization, 2,000 b/d. Treating, 10,000 b/d. Asphalt, 5,000 b/d. Wax, 40 ton/day. Sulfur recovery, 30 ton/day.

Expansion plans for a completely new $45 million, 135,000 b/d refinery in Tampico to replace eventually all three present facilities. The present 125,000 b/d capacity at Madero represents the first phase of this program.

PETROLEOS MEXICANOS. Mata Redonda, Tampico. Plant has been dismantled.

PETROLEOS MEXICANOS. Minatitlan.

Crude capacity: 75,000 b/d. Thermofor catalytic cracking, 18,000 b/d. Visbreaking, 6,500 b/d. Polymerization, 1,400 b/d. Lubes, 800 b/d.

Construction: a new topping unit of 50,000 b/d capacity was scheduled for completion mid-1961.

PETROLEOS MEXICANOS. Poza Rica.

Crude capacity: 15,000 b/d. Perco catalytic reforming, 4,500 b/d. Sulfur recovery, 150 ton/day.

PETROLEOS MEXICANOS. Reynosa.

Crude capacity: 10,000 b/d. Thermal cracking, 2,000 b/d. Natural gas plant, 300 mmcf/d.

PETROLEOS MEXICANOS. Salamanca. Plant manager, Jose Muro Lozano.

Crude capacity: 40,000 b/sd. Vacuum distillation, 16,000 b/sd. Thermal cracking, 5,000 b/sd. Perco desulfurization, 11,000 b/sd. MEK dewaxing, 3,000 b/sd. Propane deasphalting, 5,800 b/sd. Furfural extraction, 6,000 b/sd. Wax percolation, 900 b/sd. Clay contacting, 2,300 b/sd.

Expansion in crude capacity to 80,000 b/d is planned. Also planned: a 15,000 b/d Thermofor catalytic cracking unit, and a new grease plant.

PETROLEOS MEXICANOS plans a new 40,000 b/d refinery including 15,000 b/d catalytic cracking, at Mazatlan, on the Pacific Coast. A separate coking unit, to operate on reduced crude from Mazatlan, will be built at Tia Juana. Expected completion: end-1962.

Central America and Caribbean

Barbados

BARBADOS UNION OIL CO. LTD., wholly owned subsidiary of Mobil Oil. Bridgetown, Barbados.

Crude capacity: 1,200 b/d. Products: Gasoline, kerosine, diesel fuel, asphalt.

Costa Rica

PHILLIPS PETROLEUM CO. has made application to build a $10 million, 5,000 b/d refinery at Alajuela, Costa Rica. The operator is to be a joint stock company with half Costa Rica capital.

TEXACO has proposed a wholly-owned $5 million, 5,000 b/d refinery at Puerto Limon.

Cuba

BACURANAO REFINERY. Bacuranao, Havana, Cuba.

Crude capacity: 300 b/d topping.

COPETROL OIL REFINING CO. had planned an 18,000 b/d refinery at Cardenas or Nuevitas, Cuba, before the government took over private company refineries in mid-1960.

CORPORATION GENERAL DE PETROLEO REFINERIA CABAIGUAN. Jatibanico, Cuba.

Crude capacity: 1,000 b/d.

INSTITUTO CUBANO DEL PETROLEO, Belot, Cuba, formerly Esso Standard Oil Co. S.A.

Crude capacity: 35,000 b/d. Vacuum distillation, 22,140 b/sd. Fluid catalytic cracking, 14,570 b/sd (fresh feed). Powerforming, 2,400 b/d. Hydrofining, 2,400 b/d. Polymerization, 1,000 b/d. Lubes, 200 b/d. Grease, 3.2 million lb/yr.

INSTITUTO CUBANO DEL PETROLEO, Havana, Cuba, formerly Compania Petrolera Shell de Cuba, S.A.

Crude capacity: 27,000 b/d. Platformer, 5,500 b/d.

INSTITUTO CUBANO DEL PETROLEO, Santiago de Cuba, Cuba, formerly The Texas Co. (West Indies) Ltd.

Crude capacity: 20,000 b/d. Platforming, 3,300 b/d. Hydrotreating, 4,100 b/d. Linde gasoline treating, 1,500 b/d.

PETROLERA JARAHUECA S.A. Jarahueca, Cuba.

Crude capacity: 200 b/d.

REFINERIA CABAIGUAN. Cabaiguan, Cuba. President, Dr. Fernando Prado Garcia.

Crude capacity: 2,500 b/sd. Thermal cracking, 600 b/sd.

SANTO MARIO OIL REFINING CO. Cotorro, Havana, Cuba.

Crude capacity: 600 b/d topping plant.

Dominican Republic

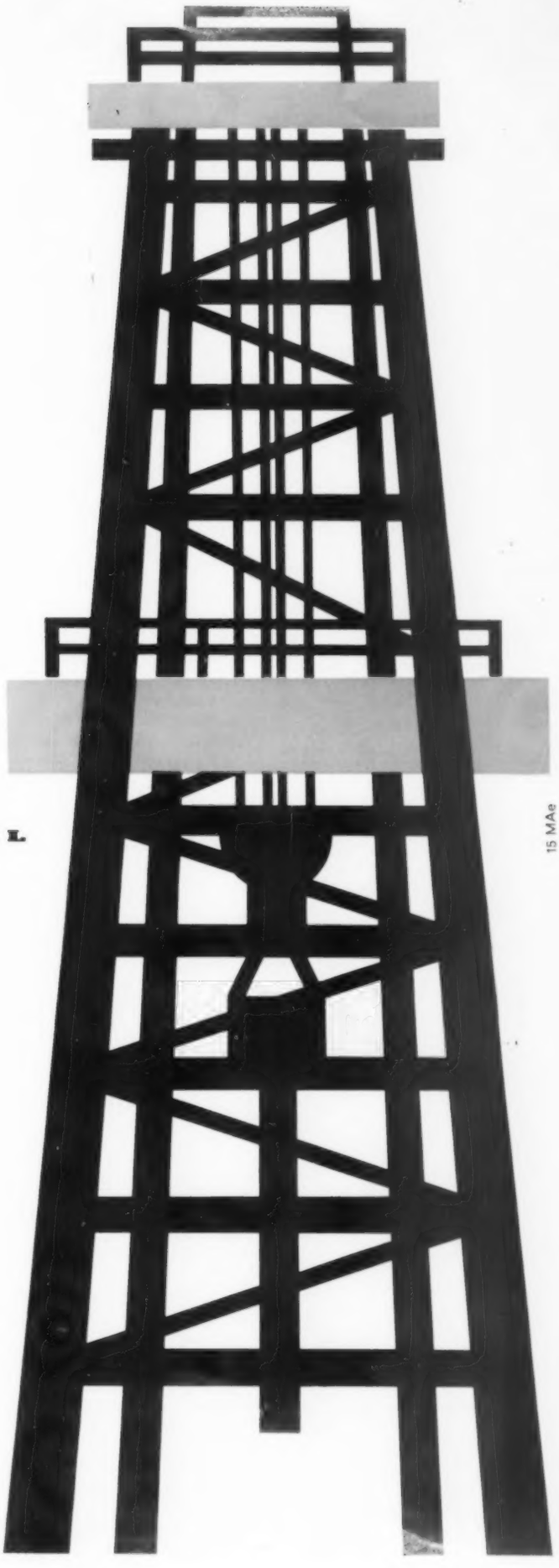
THE FRENCH COMPANY ENSA has signed a contract to build an 11,000 b/d refinery at an undisclosed site in the Dominican Republic.

Guatemala

BREAUX BRIDGE OIL REFINERY CO. INC. has virtually completed a $4 to $5 million, 4,000 b/d refinery at Puerto Matias de Galvez, Guatemala, including a 2,600 b/sd Unifiner and 1,200 b/sd Catformer. Operations are awaiting completion of a products pipeline. The plant was largely prefabricated

(*Continued on page 73*)

Mercedes-Benz are on the job, putting punch into drill rigs on the world's oilfields. They bear the Mercedes-Benz star - the symbol for their performance-proved features: robustness, high duty in continuous operation and low weight.



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MERCEDES-BENZ DIESEL

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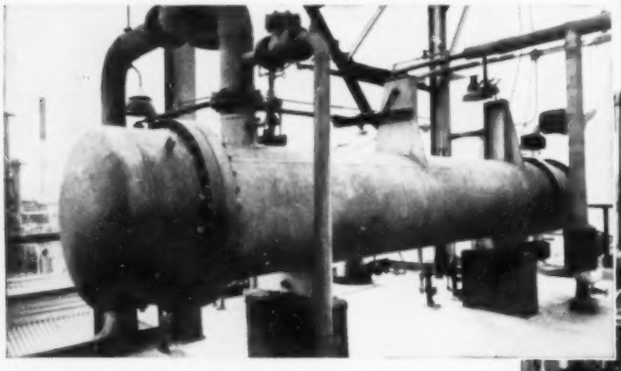
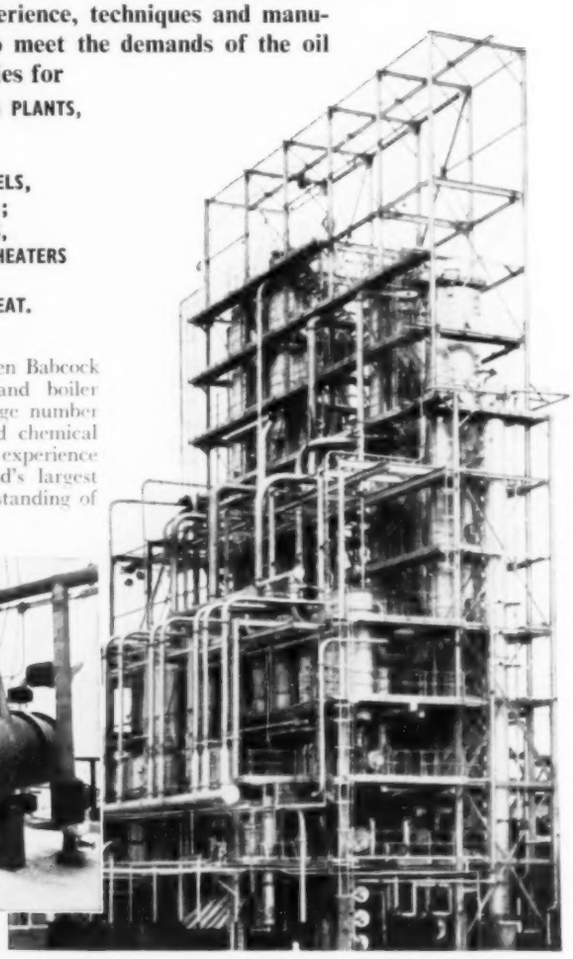


Heat-exchanger built by Babcock, in service at an oil refinery.



Distillation unit at an oil refinery, comprising Babcock fusion-welded columns.

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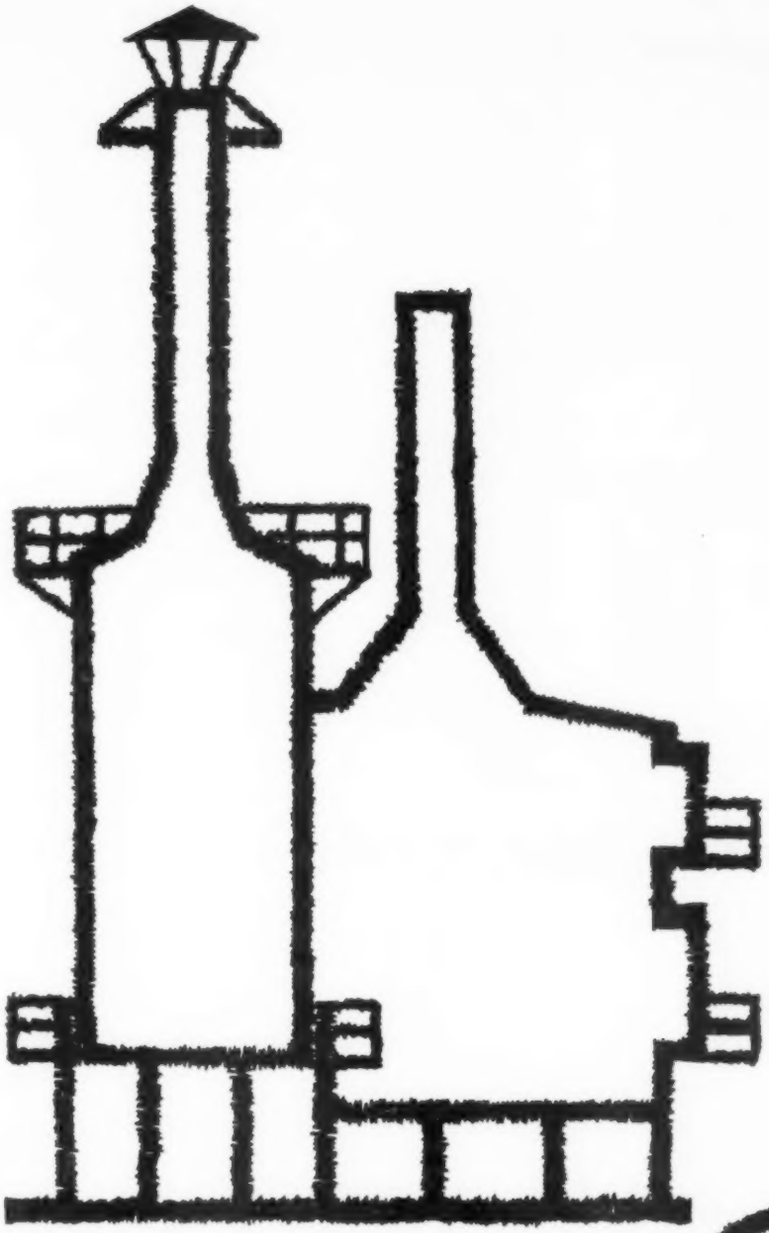

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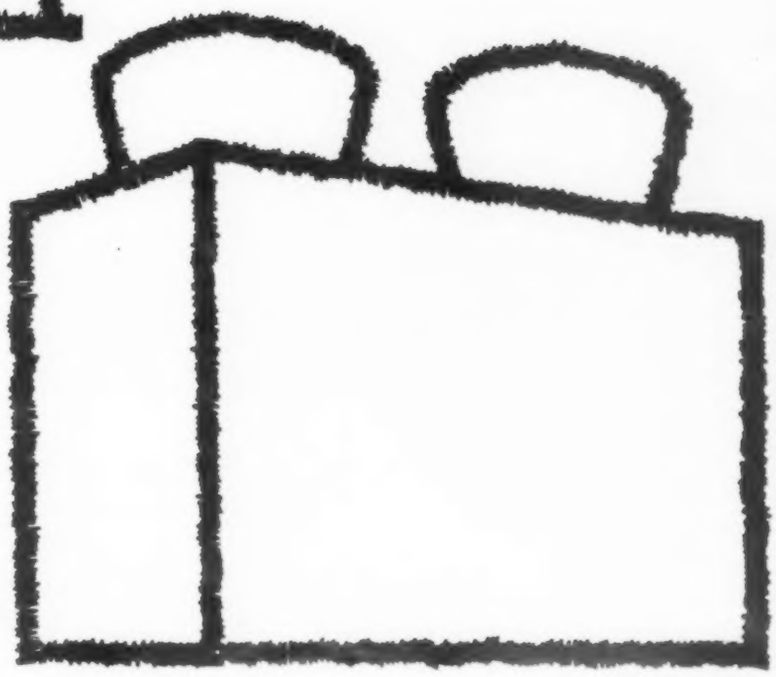

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CIA PETROLERA DELHI GUATEMALA S.A. has asked for government approval to build an $8.8 million, 10,000 b/d refinery at Matias de Galvez, Guatemala's major Caribbean port. Products would include two grades of gasoline, kerosine, diesel and fuel oil.

REFINERIA PETROLEOS DE GUATEMALA, S.A. plans a 12,000 b/d, $18 million refinery near Matias de Galvez. New company is seeking government approval on behalf of a group headed by Phillips Petroleum Co. Products are to include regular and high octane gasoline, kerosine, diesel fuel, fuel oil, asphalt and LPG.

Honduras

A 15,000 b/d refinery plant is reported to be up for government approval at an undisclosed site in Honduras.

Jamaica

ESSO STANDARD S.A. have had plans for a 26,000 b/d refinery near Kingston, Jamaica, with expected completion in 1961 or 1962. No further information has been disclosed.

Nicaragua

A 10,000 b/d refinery is said to be planned for an undisclosed site in Nicaragua. No further information is available.

Panama

GOLDEN EAGLE REFINING CO. OF PANAMA. Portobelo Harbor, Panama.
A new 60,000 b/d $59 million refinery and petrochemical plant scheduled for completion in November, 1962. Arthur G. McKee Co. has construction contract.

REFINERIA PANAMA S.A. is building a 30,000 b/d $30 million refinery at Las Minas, Panama. Completion date early 1962. Contractor is Bechtel Corp. Processing units will include visbreaking, catalytic reforming, desulfurization, and asphalt.

Puerto Rico

CARIBBEAN REFINING CO. San Juan, Puerto Rico. Vice President, mfg., Eugene G. Case.
Crude capacity: 15,000 b/d. Vacuum distillation, 10,000 b/d. UOP Fluid catalytic cracking, 8,500 b/d. Polymerization, 1,200 b/d.

COMMONWEALTH OIL REFINING CO. INC. Ponce, Puerto Rico. Plant manager, C. W. Brackin.
Crude capacity: 80,000 b/d. Vacuum distillation, 48,700 b/d. Visbreaking, 20,000 b/d. Houdry catalytic cracking, 53,600 b/d. Houdriforming, 7,460 b/d. Unifining, 10,000 b/d. Polymerization, 4,500 b/d. Sulfuric acid alkylation, 1,400 b/d. SO_2 extraction, kerosine, 4,400 b/d. Howe-Baker treating, gasoline, 2,000 b/d.

South America

Argentina

CIA CONDOR. Avellaneda, Argentina.
Crude capacity: 900 b/d.

CIA. GENERAL ASFALTOS. Wilde, Buenos Aires, Argentina.
Crude capacity: 400 b/d.

SHELL CIA ARGENTINA DE PETROLEO S.A. Buenos Aires, Argentina.
Crude capacity: 27,000 b/d. Thermal cracking, 26,000 b/d. Thermal reforming, 3,300 b/d. Solvent refining, 600 b/d.
Under construction: a new crude distillation unit, 33,000 b/d. Probable completion, early 1962, and catalytic cracking, 16,000 b/d, early 1963.

ESSO S.A.P.A. Bahia Blanca, Argentina.
Crude capacity: 10,000 b/d. Thermal cracking, 5,000 b/d.

ESSO S.A.P.A. Campana (Buenos Aires) Argentina. Manager: A. E. London.
Crude capacity: 65,000 b/d. Vacuum distillation, 7,000 b/d. Thermal cracking, 20,000 b/d. Model IV Fluid catalytic cracking, 16,000 b/d. Solvent refining (lubes), 2,000 b/d. Clay treating, 300 b/d.
Esso has applied for permission to invest up to $30 million in new lube oil facilities at Campana and at Bahia Blanca.

ESSO S.A.P.A., Manuel Elordi (Salte), Argentina.
Crude capacity: 1,300 b/d.

ESSO S.A.P.A., Plaza Huincul, Argentina.
Crude capacity: 500 b/d.

HYDROCARBON ARGENTINA S.A. (owned jointly by Minera Alumine of Buenos Aires and Hydrocarbon Research Inc. of New York) will build a $15 million plant at San Lorenzo, Argentina, with completion in 1963, for the production of 8,000 to 11,000 b/d high octane gasoline and 700 b/d benzene; operating on 12,000 b/d of naphtha feedstock from YPF facilities at San Lorenzo and Campo Duran.

LOTTERO Y PAPINI. Pineyro (Buenos Aires), Argentina.
Crude capacity: 900 b/d.

PETROQUIMICA (Y.P.F.). Comodoro Rivadavia, Argentina.
Crude capacity: 5,500 b/d. Thermal cracking, 2,000 b/d. Visbreaking.

REFINERÍA DE PETRÓLEO "LA ISAURA" S.A. Bahia Blanca, Argentina. General manager, José Manuel Elicabe.
Crude capacity: 2,000 b/d. Thermal cracking, 1,200 b/d.

TENNESSEE GAS TRANSMISSION CO. has placed into operation a 200 b/d, $70,000 experimental, portable topping unit at Tierra del Fuego, Argentina. Prime contractor: Williams Bros. Co. of Tulsa.

YACIMIENTOS PETROLIFEROS FISCALES (Y.P.F.) Chachapoyas (Salta), Argentina. Manager, Claudio V. Bianco.
Crude capacity: 3,500 b/d. Thermal cracking, 1,300 b/d.
Planning a 3,150 b/d naphtha reformer.

Y.P.F. Campo Duran, Argentina.
Crude capacity: 31,000 b/d.

Y.P.F. Dock Sud—Avellaneda, Argentina. Manager, Ruben L. Antola.
Crude capacity: 6,000 b/d. Vacuum distillation, 2,200 b/d. Thermal cracking, 2,000 b/d. Lube oils, 340 b/d.
Long range plans are to increase capacity to 44,000 b/d.

Y.P.F. La Plata, Argentina. Manager, Vicente Garcia Cano.
Crude capacity: 120,000 b/d. Vacuum distillation, 7,000 b/d. Visbreaking, 16,000 b/d. Thermal cracking, 20,000 b/d. Catalytic cracking, 16,000 b/d. Alkylation, 5,500 b/d. Polymerization, 3,300 b/d. Lube oils, 530 b/d. Asphalt, 1,300 b/d.
Expansion in crude capacity by 20,000 b/d was completed during past year at cost of 25 million pesos.

Y.P.F. Lujan de Cuyo (Mendoza), Argentina. Manager, Gabriel Llamas.
Crude capacity: 14,000 b/d. Thermal cracking, 2,000 b/d. Visbreaking, 6,300 b/d.
Expansion of crude capacity to 40,700 b/d, and installation of a 16,600 b/d catalytic cracking unit and an 18,500 b/d delayed coking unit, will be completed in 1961, at a cost of $25 million. M. W. Kellogg is the prime contractor.

Y.P.F. Plaza Huincul (Neuquen), Argentina. Manager, C. A. de Ipola.
Crude capacity: 2,500 b/d. Thermal cracking, 500 b/d.

Y.P.F. San Lorenzo, Argentina. Manager, Luis J. Macario.
Crude capacity: 25,000 b/d. Thermal cracking, 6,000 b/d. Visbreaking, 6,000 b/d.
Expansion in crude capacity to 28,000 planned.

Bolivia

YACIMIENTOS PETROLIFEROS FISCALES BOLIVIANOS (YPFB). Camiri, Bolivia.
Crude capacity: 1,500 b/d.

YACIMIENTOS PETROLIFEROS FISCALES BOLIVIANOS. Cochabamba refinery, Cochabamba, Bolivia. Plant manager, Mario Balcázar Aranibar.
Crude distillation: 6,000 b/d. Doctor sweetening, 3,000 b/d. Light ends recovery, 2,000 b/d.

Y.P.F.B. Sanandita, Bolivia.
Crude capacity: 400 b/d.

Y.P.F.B. Sucre, Bolivia.
Crude capacity: 4,000 b/d.

Brazil

COMPANHIA DE PETROLEO DA AMAZONIA. Manaus, Amazonas, Brazil. Superintendent, H. Weiser.
Crude capacity: 6,500 b/sd. Vacuum distillation, 2,000 b/sd. Fluid catalytic cracking, 2,000 b/sd. Caustic treating, 5,000 b/sd.

DISTILLARIA RIO GRANDENSE DE PETROLEO, S.A. Rio Grande du Sul, Brazil.
Crude capacity: 300 b/d.

INDUSTRIAS MATARAZZO DE ENERGIA, S.A. Sao Paulo, Brazil.
Crude capacity: 1,300 b/d.

IPIRANGA S.A. CIA BRASILEIRA DE PETROLEO. Rio Grande, Brazil.
Crude capacity: 9,300 b/d. Thermal cracking, 2,000 b/d.

PETROLEO BRASILEIRO (PETROBRAS). Cubatao, Sao Paulo, Brazil. Plant manager, Irto Sardenberg.
Crude capacity: 110,000 b/sd. Thermal cracking, 9,000 b/sd. Thermal reforming, 11,000 b/sd. Houdriforming, 11,000 b/sd. Polymerization, 1,800 b/sd. Treating, Edeleanu and Tannin Solutizer. Other products: fertilizers and calcium ammonium nitrate.
Construction planned includes ethane cracking and aromatics extraction units, and crude expansion to 115,000 b/d.

PETROLEO BRASILEIRO S.A. (PETROBRAS). Salvador (Mataripe), Bahia, Brazil. Plant manager, Roque Perrone.
Crude capacity: 42,000 b/sd. Vacuum distillation, 10,500 b/sd. Thermal cracking, 2,500 b/sd. Orthoflow catalytic cracking, 12,000 b/sd (fresh feed). Polymerization, 694 b/sd. Treating (phenol extraction, propane dewaxing, propane deasphalting, percolation).
Expansion in crude capacity was completed at end of 1960, at cost of $30 million.

PETROBRAS. Duque de Caxias, Rio de Janeiro, Brazil.
Crude capacity: 90,000 b/d.
New $60 million refinery, completed in January, 1961. Foster Wheeler was contractor.

PETROBRAS plans a $99 million, 25,000 b/d refinery at Santa Lucia, near Belo Horizonte, Brazil.

REFINARIA DE PETRÓLEOS DE MANGUINHOS S.A. Rio de Janeiro, Brazil. Plant manager, Eduardo Difini.
Crude capacity: 10,000 b/d. Thermal cracking, 6,500 b/d. Caustic treating, 10,000 b/d.

REFINERIA E EXPLORACAO DE PETROLEO "UNIAO" S.A. Capuava (Sao Paulo), Brazil. Plant manager, Carlos Eduardo Paes Barresto.
Crude capacity: 31,000 b/d. Vacuum distillation, 8,000 b/d. Thermofor catalytic cracking, 35,000 b/d. Polymerization, 1,000 b/d. Copper sweetening, 17,000 b/d.

Chile

EMPRESA NACIONAL DEL PETROLEO (E.N.A.P.) Concon, Chile. Plant manager, Fernando Reich K.
Crude capacity: 44,000 b/d. Vacuum distillation. Thermal cracking, 10,000 b/sd. Thermal reforming, 4,000 b/sd. Orthoflow Model B catalytic cracking, 12,000 b/sd. SBK catalytic reforming, 6,000 b/sd. Cobalt molybdate catalytic desulfurization, 6,000 b/sd. Kellogg Model B sulfuric acid alkylation, 1,100 b/sd. Naphtha rerunning, 1,200 b/sd. DEA, caustic and inhibitor sweetening. Petreco desalting, 24,000 b/sd. Sulfuric acid treating, 15 metric ton/day.
Planned: $3 million lube oil unit.

E.N.A.P. Manatiales, Chile.
Crude capacity: 700 b/d.

REFINERIA CHILENA DE PETROLEOS y PETROQUIMICA, S.A. Correo Estacion Maipu, Santiago, Chile. Manager, Arturo Sramek.
Crude capacity: 2500 b/d.

Colombia

COLOMBIAN PETROLEUM CO. Tibu, Colombia. Plant manager, R. E. Alsup.
Crude capacity: 3,300 b/d. Principal products, gasoline, diesel fuel, kerosine.

EMPRESA COLOMBIANA DE PETROLEOS. La Dorada, Colombia.
Crude capacity: 4,000 b/d.

EMPRESA COLOMBIANA DE PETROLEOS. Barrancabermeja, Colombia. Formerly operated by International Petroleum (Colombia) Ltd.

Crude capacity: 36,500 b/cd. Visbreaking, 16,500 b/cd. Fluid Model IV catalytic cracking, 15,130 b/cd. Sulfuric acid alkylation, 1,200 b/cd. Phenol extraction for lubes, 400 b/cd. Caustic treating. Asphalt oxidation, 125 b/cd. Grease, 61 b/cd. Solvents, 1,200 b/cd. Acid plant, 25 ton/day.

Under consideration: expansion in crude capacity.

INTERNATIONAL PETROLEUM (COLOMBIA) LTD. Intercol-Cartagena refinery, Cartagena, Colombia. Plant manager, P. R. Ratliff.

Crude capacity: 26,500 b/d. Vacuum distillation, 18,000 b/sd. Fluid Model IV catalytic cracking, 13,000 b/d (fresh feed). Polymerization, 3,600 b/sd. Caustic treating. Naphthenic acid manufacture.

THE TEXAS CO. Guama, Colombia.

Crude capacity: 1,100 b/d.

Ecuador

ANGLO-ECUADORIAN OILFIELDS LTD. Guayaquil, Eucador. Plant manager, B. V. Fenton.

Crude capacity: 13,000 b/d. Vacuum distillation, 300 b/d. Thermal cracking, 6,600 b/d. Caustic treating, 4,000 b/d. Lube oil acid treating and clay treating.

Expansion in crude capacity to 21,000 b/d, at cost of $4.5 million, planned for completion in 1961.

MANABI EXPLORATION CO. INC. Cautiro, Ecuador.

Crude capacity: 500 b/d.

TENNESSEE DEL ECUADOR S.A., Guayaquil, Ecuador. Plant manager, Stanley G. Moss.

Crude capacity, 2,500 b/d. Gas absorption unit, 3 mmcf/d.

Netherlands Antilles

LAGO OIL & TRANSPORT CO. LTD. Aruba, Netherlands Antilles. General manager, W. A. Murray.

Crude capacity: 470,000 b/sd (440,000 b/cd). Vacuum distillation, 19,200 b/sd. Thermal cracking, 313,000 b/sd. Fluid catalytic cracking, 45,000 b/sd. Sulfuric acid alkylation, 6,700 b/sd. Butane isomerization, 2,400 b/sd. Edeleanu extraction, 44,000 b/sd. Sulfuric acid treating 49,000 b/sd.

SHELL CURACAO N.V. Emmastad, Curacao, Netherland Antilles.

Crude capacity: 210,000 b/d. Thermal cracking, 85,000 b/d. Catalytic cracking, 35,000 b/d. Thermal reforming, 20,000 b/d. Alkylation, 4,500 b/d. Solvent refining (lubes), 6,600 b/d.

Paraguay

COMPAGNIE FIVES-LILLE at one time indicated plans for a 10,000 b/d refinery at Asuncion, Paraguay. No further information has been reported.

Peru

CIA DE PETROLEO GANSO AZUL LTDA. Pucallpa, Peru. Plant manager, J. Carranza B.

Crude capacity: 1,100 b/sd.

CIA PETROLERA LOBITOS has applied for approval to build a refinery and lube oil plant at Callao, Peru.

EMPRESA NACIONAL DE PETROLEO plans a refinery of undisclosed capacity at the port of Talcaguana, Peru, noth of Concepcion. Report is that it will be about 40,000 b/d, and completion date is 1964.

EMPRESA PETROLERA FISCAL (E.P.F.) Iquitas, Peru.

Crude capacity: 1,500 b/d.

INTERNATIONAL PETROLEUM CO. Talara, Peru. Manager, C. Nielsen.

Crude capacity: 45,000 b/d. Thermal cracking, 14,500 b/d. Lubes, 500 b/d.

An expansion in crude capacity has been reported in the planning stages.

MOBIL OIL CO. OF PERU has applied for approval to construct a refinery and lube oil plant at Callao, Peru.

REFINERIA CONCHAN-CALIFORNIA S.A. will complete in late 1962 a $15 million 6,600 b/d refinery at Conchan (near Lima), Peru. Fluor Corp. Ltd. has engineering and procurement contract for the crude unit. It is a joint enterprise of Standard Oil of California and Peruvian capital. President is Dr. Mariano Prado.

El Salvador

SHELL EL SALVADOR S.A. has started construction of a $9 million, 10,000 b/d refinery at Acajutla, El Salvador, with completion expected in mid-1962. Downstream processes will include catalytic reforming and hydrotreating. Contractor is Fluor-Schuitvlot N.V. of the Netherlands.

Esso Standard Oil S.A. also has long term plans for a 10,000 b/d refinery and had taken an option on land adjoining Shell's property. Latest report is that both companies have asked the government for permission to jointly build a 15,000 b/d refinery in place of the current projects.

Trinidad

SHELL TRINIDAD LTD. Point Fortin, Trinidad. Refinery manager, M. I. Smith.

Crude capacity: 52,000 b/d. Asphalt, 6,000 b/d. Caustic treating (gasoline, 12,000 b/d), (kerosine 8,000 b/d). Naphthenic acid production, 10 ton/day.

Expansion in capacity by 14,000 b/d was scheduled for completion this year.

THE TEXAS CO. La Brea, Trinidad.

Crude capacity: 5,000 b/d.

TEXACO TRINIDAD INC. Pointe-a-Pierre, Trinidad, West Indies. Plant Manager, H. W. Macnaughton-Jones.

Crude capacity: 235,000 b/d. Vacuum distillation, 60,000 b/d. Visbreaking, 25,000 b/d. Fluid catalytic cracking, 28,000 b/d. Platforming, 24,000 b/d. Unifining, 8,500 b/d. Hydrotreating, 20,000 b/d. Polymerization, 1,300 b/d (feed). Sulfuric acid alkylation, 2,200 b/d. Vapor phase isomerization, 2,000 b/d.

Uruguay

ADMINISTRATION NACIONAL DE COMBUSTIBLES, ALCOHOL Y PORTLAND (ANCAP). Montevideo, Uruguay.

Crude capacity: 46,000 b/d. Thermal cracking, 2,200 b/d. Catalytic cracking, 5,000 b/d. Catalytic reforming, 3,000 b/d.

Venezuela

CIA SHELL DE VENEZUELA. Cardón refinery, Punto Fijo, Venezuela. Plant manager, I. A. Willmott.

Crude capacity: 271,000 b/sd. Vacuum distillation, 89,000 b/sd. Thermal cracking 28,000 b/sd. Thermal reforming, 8,700 b/sd. Fluid catalytic cracking, 35,000 b/sd. Polymerization, 2,000 b/sd. HF alkylation, 2,500 b/sd. Propane deasphalting, Furfural extraction, and MEK dewaxing, total 3,000 b/sd. Treating (Doctor, air Solutizer, caustic).

CIA SHELL DE VENEZUELA. San Lorenzo, Venezuela.

Crude capacity: 45,000 b/d.

CREOLE PETROLEUM CORP. Amuay Bay, Venezuela. Refinery manager, H. De N. Wynne.

Crude capacity: 328,000 b/d. Powerforming, 10,200 b/d. Hydrofining, 17,000 b/d. Solvent refining (lubes), 700 b/d.

CREOLE PETROLEUM CORP. Caripito, Venezuela. Superintendent, F. K. Davis.

Crude capacity: 60,000 b/d. Visbreaking, 42,000 b/d.

PETROCHEMICAL INSTITUTE. Moron, Venezuela.

Crude capacity: 3,000 b/d.

PHILLIPS PETROLEUM CO. San Roque, Venezuela. Plant manager, F. H. Keck.

Crude capacity, 3,500 b/d. Wax manufacture, 800 metric ton/month.

RICHMOND EXPLORATION CO. Bajo Grande, Venezuela. Plant manager, L. H. Allen.

Crude capacity: 53,000 b/d. Topping, 43,000 b/d. Combination still, 10,000 b/d.

SINCLAIR VENEZUELAN OIL CO. Puerto la Cruz, Venezuela. Superintendent: J. J. Connelly.

Crude capacity: 35,000 b/d. Visbreaking, 12,000 b/d.

SOCONY MOBIL OIL DE VENEZUELA. Puerto Cabello, Venezuela.

Crude capacity: 50,000 b/d. Catalytic reforming, 5,500 b/d.

TEXAS PETROLEUM CO. Tucupita, Venezuela. Plant manager, W. F. Hoffman.

Crude capacity: 10,000 b/d.

VENEZUELA GULF REFINING CO. Apartado 16, Barcelona, Venezuela. Superintendent, G. H. Keating.

Crude capacity: 125,000 b/sd. Visbreaking, 14,500 b/sd. Polyforming, 12,000 b/sd. Fluid (Orthoflow) cracking, 8,650 b/sd. Copper sweetening, 30,000 b/sd.

Western Europe

Austria

A. G. DER SHELL FLORIDSDORFER MINERALOELFABRIK. Floridsdorf (Vienna), Austria.

Crude capacity: 4,300 b/d. Lube processing, 1,000 b/d.

KLEDERINGER MINERAOEL RAFFINERIE. Kledering (Vienna), Austria.

Crude capacity: 140 b/d.

MOBIL OIL AUSTRIA A.G. Vienna, Austria. Plant manager, F. Kubelka.

Crude capacity: 3,400 b/cd. Vacuum distillation, 1,300 b/cd. Lube oil treating, 140 b/sd. Grease manufacture, 70 b/sd.

OESTERREICHISCHE MINERALOEL VERWALTUNG A.G. (OeMV). Schwechat (Vienna), Austria.

Crude capacity: 36,000 b/d. Vacuum distillation, 880 b/d. Thermal cracking, 5,210 b/d. Platformer-Unifiiner, 5,000 b/d. Lube processing, 400 b/d. Gasoilne treating, 4,300 b/d. Asphalt, 3,400 b/d. Solvents, 700 b/d.

New refinery, completed January 1961, at cost of about $23 million. Under construction: new catalytic cracking unit, 5,000 b/d, for completion in 1962. Planned, ultimate expansion by 18,000 b/d of crude capacity.

OESTERREICHISCHE MINERALOEL VERWALTUNG A.G. (OeMV). Voesendorf (Vienna), Austria.

Crude capacity: 2,325 b/d.

RICHARD K. van SICKLE. Neusiedl Zaya, Niederösterreich, Austria. Plant manager, Stephan Marmeler.

Crude capacity: 335 b/d. Principal products, motor fuel, diesel fuel, fuel oil.

Belgium

"ALBATROS" S.A. BELGE POUR LE RAFFINAGE DE PETROLE. Antwerp, Belgium.

Crude capacity: 13,000 b/d. Catalytic cracking, 4,100 b/d. Catalytic reforming, 2,500 b/d. Polymerization, 600 b/d.

BELGIAN SHELL CO. S.A. Ghent, Belgium.

Crude capacity: 2,700 b/d. Solvent refining (lubes), 500 b/d.

ESSO BELGIUM S.A. Antwerp, Belgium. Manager, Mfg., H. P. Relder.

Crude capacity: 36,000 b/d. Model IV Fluid catalyatic cracking, 9,500 b/d. Thermal reforming, 3,700 b/d. Powerforming, 5,000 b/d. Hydrofining, 6,200 b/d.

RAFFINERIE BELGE DE PETROLES S.A. Antwerp, Belgium.

Crude capacity: 16,700 b/d. Thermal reforming, 2,700 b/d. Catalytic reforming, 2,300 b/d. Desulfurization, 4,500 b/d.

Construction: 24,000 ton/yr LPG unit and 800 ton/day asphalt unit.

SOCIETE INDUSTRIELLE BELGE DES PETROLES. Antwerp, Belgium. Plant manager, Gerard Legrand.

Crude capacity: 90,000 b/sd. Vacuum distillation, 20,000 b/sd. Thermal reforming, 7,000 b/sd. Fluid catalytic cracking, 12,500 b/sd. Platforming, 10,000 b/sd. Hydrofining, 10,000 b/sd. Polymerization, 3,000 b/sd. Copper chloride treating, 18,0000 b/sd.

Under construction: $30.8 million expansion, with completion by early 1963; including crude capacity increase to 160,000 b/d, 9,000 b/d catalytic reforming, 10,000 b/d hydrofining, expansion of catalytic cracking to 15,000 b/d and 60 ton/day sulfur recovery.

TANKAGE & TRANSPORT S.A. Antwerp, Belgium.

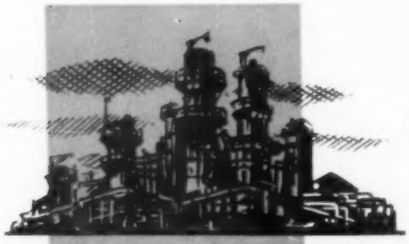
Crude capacity: 4,900 b/d. Catalytic reforming, 700 b/d.

Denmark

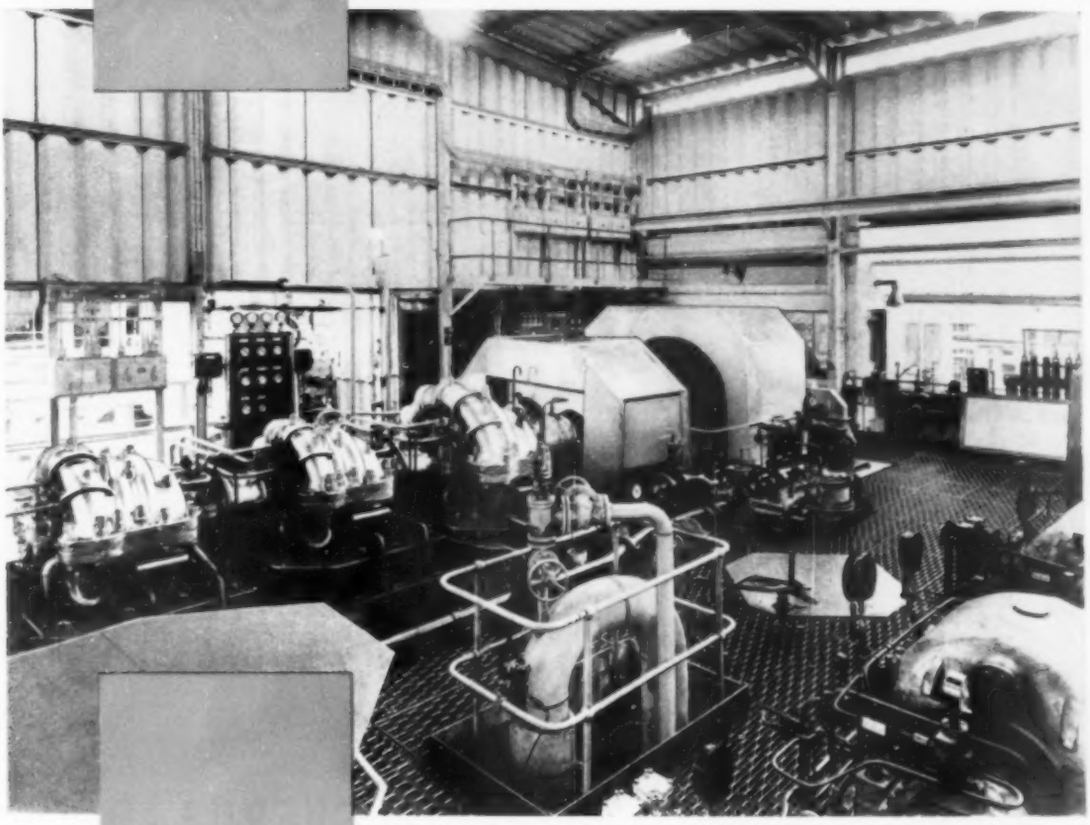
A. S. KALUNDBORG. Kalundborg, Denmark. President, A. Tholl.

Crude capacity: 600 b/d.

(*Continued on page 87*)



Compressors for the Chemical and Refinery Industries



An installation comprising one HSD type and two HSC 3 type H & W centrifugal compressors, in operation on propylene gas at the Carrington Works of Petrochemicals, Limited.

H&W Centrifugal Compressors

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Enquiries Queen's Island, Belfast — London Office 4, Whitehall, S.W.1

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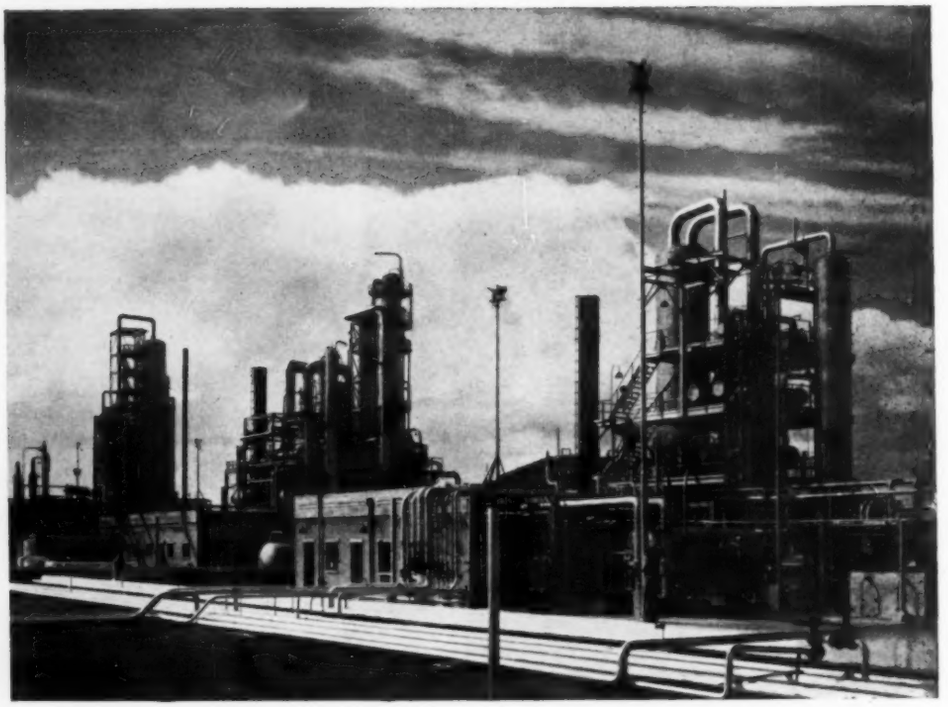

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of the apparatuses used in the erection of oil refineries or required for the improvement of their production are delivered to all countries in the world by the Company COCKERILL-OUGREE.

Their Boiler-making Shops which are equipped with the most recent and powerful installations enable them to manufacture the whole range of products in both oil refinery and boiler-making lines without any restriction in respect to the sizes, the weights or the manufacturing processes.

The irons and steels used are produced in the iron and steel divisions of the Company which, thanks to its still increasing production capacity, ranks among the most powerful industrial concerns in the E.C.S.C.

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LINE AND SHUNTING LOCOMOTIVES - DIESEL ENGINES UP TO 25,000 HP - COMPLETE BOILERS FOR POWER STATIONS - SHIPS OF ALL KINDS AND DEADWEIGHT CAPACITIES - TRACK MATERIAL - SPECIAL STEELS - THE WHOLE RANGE OF THE FLAT STEEL PRODUCTS - GALVANIZED STEEL SHEETS - TINPLATE - ELECTRICAL STEEL SHEETS, ETC.

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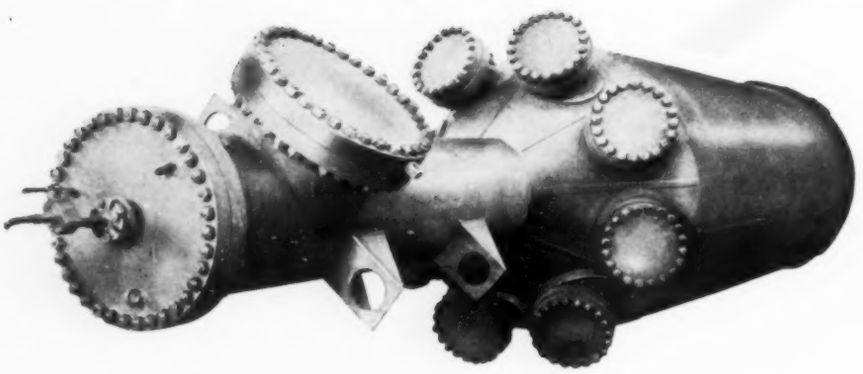

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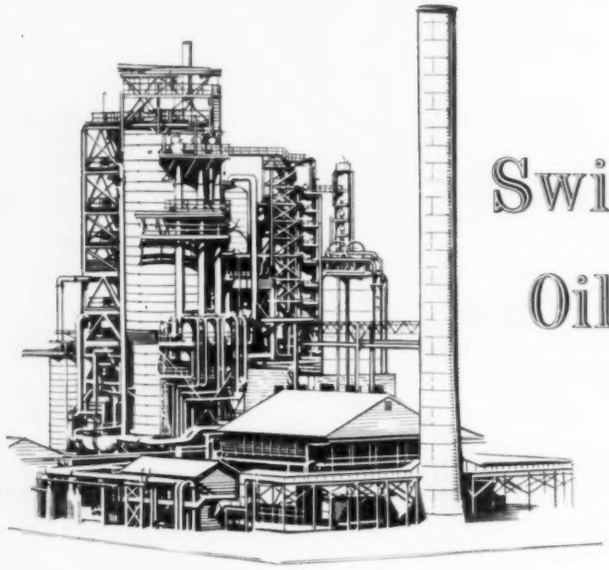

Switchgear for Oil Refineries

Reyrolle with their comprehensive manufacturing and testing facilities and their world-wide organisation, are well equipped to supply a wide range of switchgear and control equipment to meet the requirements of modern oil installations from generation to distribution

Some of the refineries who are already using Reyrolle switchgear and control-gear

- CORYTON, GRANGEMOUTH,
- ISLE OF GRAIN, LLANDARCY,
- NORTHWICH, SHELLHAVEN,
- STANLOW, GEELONG,
- KWINANA, SARNIA,
- FRONTIGNAN, L'AVERA, SERIA,
- BOMBAY, VENICE, CARDON,
- MARACAIBO, HAMBURG,
- PERNIS, LAGOS, HAIFA,
- ADEN, IRAN, IRAQ,
- KUWAIT, BAHREIN, BURMA,
- CEYLON, and MALTA.

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Werkspoor does the assembling too!

2,000 men are on hand to work for Werkspoor's Construction Department. A permanent team of key personnel and the most extensive range of equipment are your guarantees that every job, large or small, will be handled in the best way and in the shortest possible time. Complete factories and plants, boiler installations, buildings, bridges and pipelines, either made by Werkspoor or by other manufacturers, are assembled by these experts in all parts of the world.

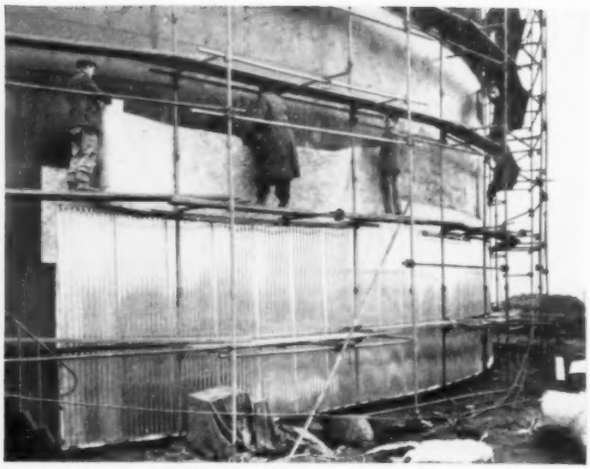
WERKSPOOR

WORKS AT UTRECHT (NETHERLANDS)

MANUFACTURERS - CONSTRUCTORS - CONTRACTORS

If you want the benefit of ESSO's experience of insulating tanks . . .

LOOK AT THESE TWO PICTURES



They show the method of applying Crown insulation used on the tanks in the new Esso installation at Tynemouth.

First Stud-weld a series of pins to the surface of the tank.

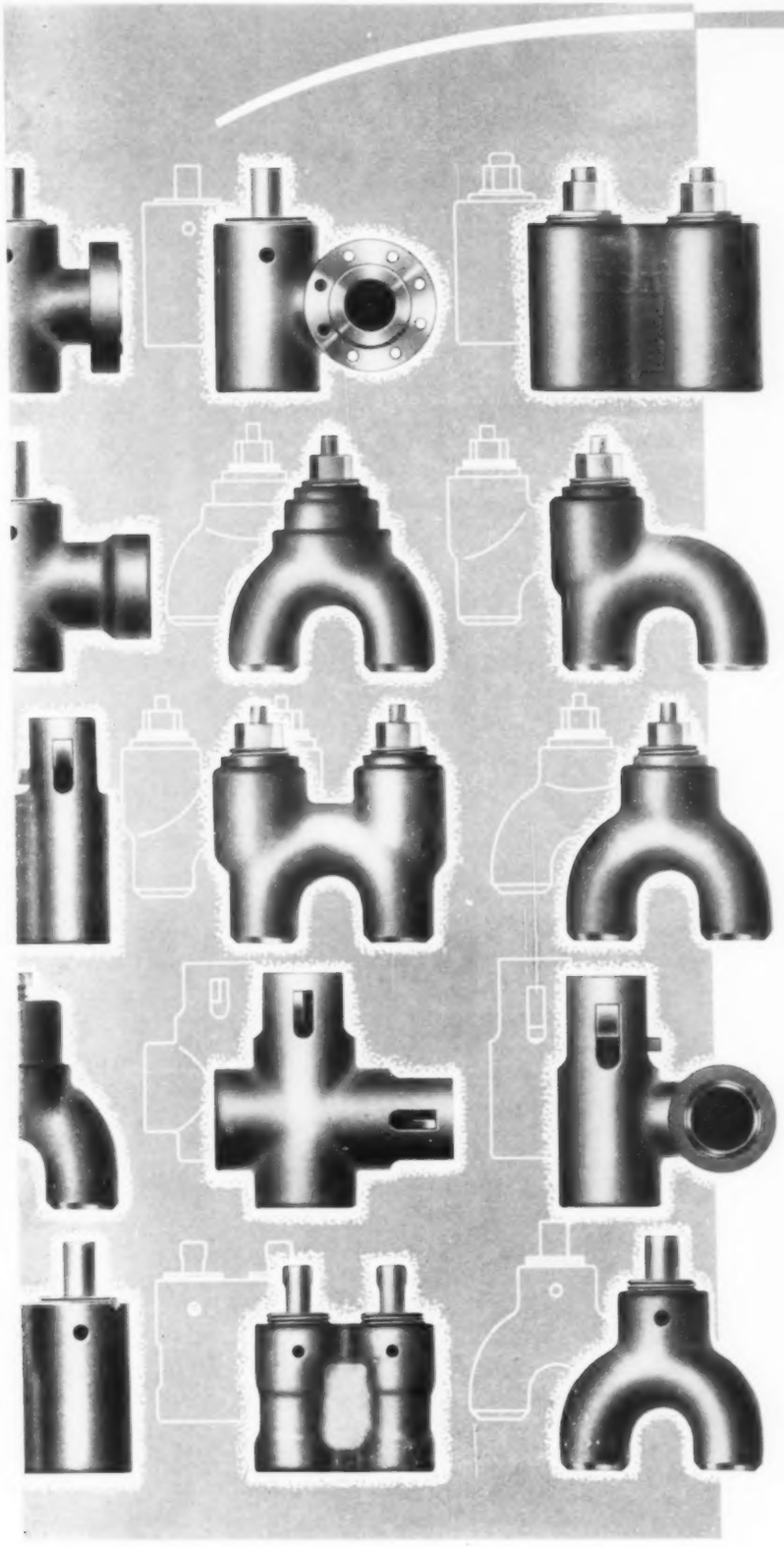
Second Impale Fibreglass Crown insulation on these pins. Because of its high tear strength it will be supported by the pins indefinitely and without sagging.

Third Cover with light-gauge corrugated sheet metal impaled on the same pins and secured by caps crimped over the prepared ends of the pins.

This method is not only effective and good looking but inexpensive. It does away with the separate framing otherwise necessary, and holds the insulation securely to the tank itself. You can learn more about the advantages from . . . .

FIBREGLASS
TRADE MARK

FIBREGLASS LIMITED,
ST. HELENS, LANCS.



W-K-M KEY REFINERY FITTINGS . . . .

ARE DIRECTLY AVAILABLE THROUGHOUT THE FREE WORLD

W-K-M Key Refinery Fittings licensees are strategically located to serve you better. No matter where you are, a highly trained Key Products field service engineer is also at your disposal in working out your fitting design problems for direct-fired furnaces.

Forty years of continuous research, broad experience and active participation in fitting design have been combined to anticipate your needs.

In addition, W-K-M pioneered in encouraging the reconditioning of fittings to extend service life — and this money-saving policy has been upheld through the years.

Wherever you may be — throughout the free world — you can order W-K-M Key Return Bend Refinery Fittings either from W-K-M in Houston or directly from the listed licensees.

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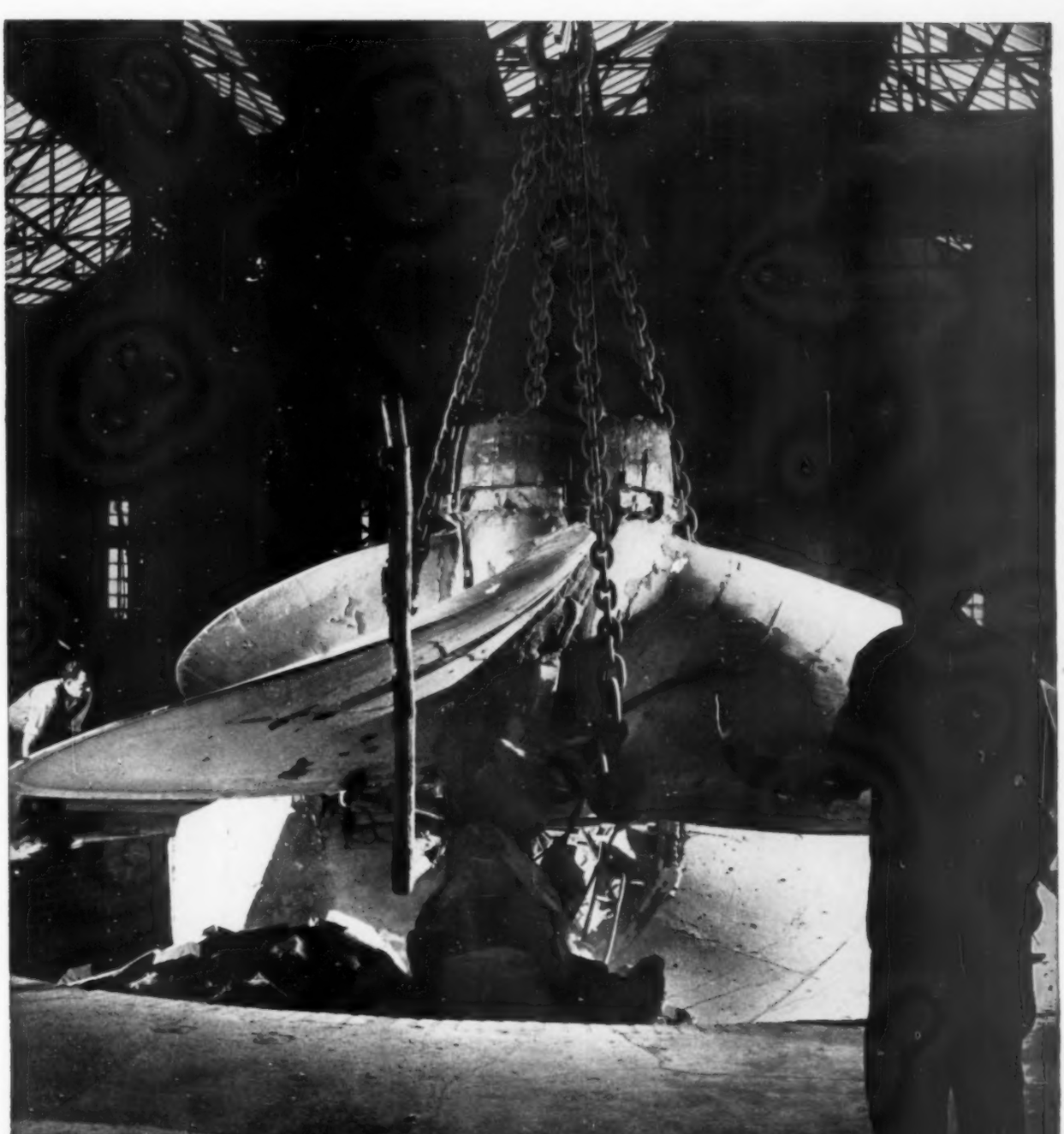

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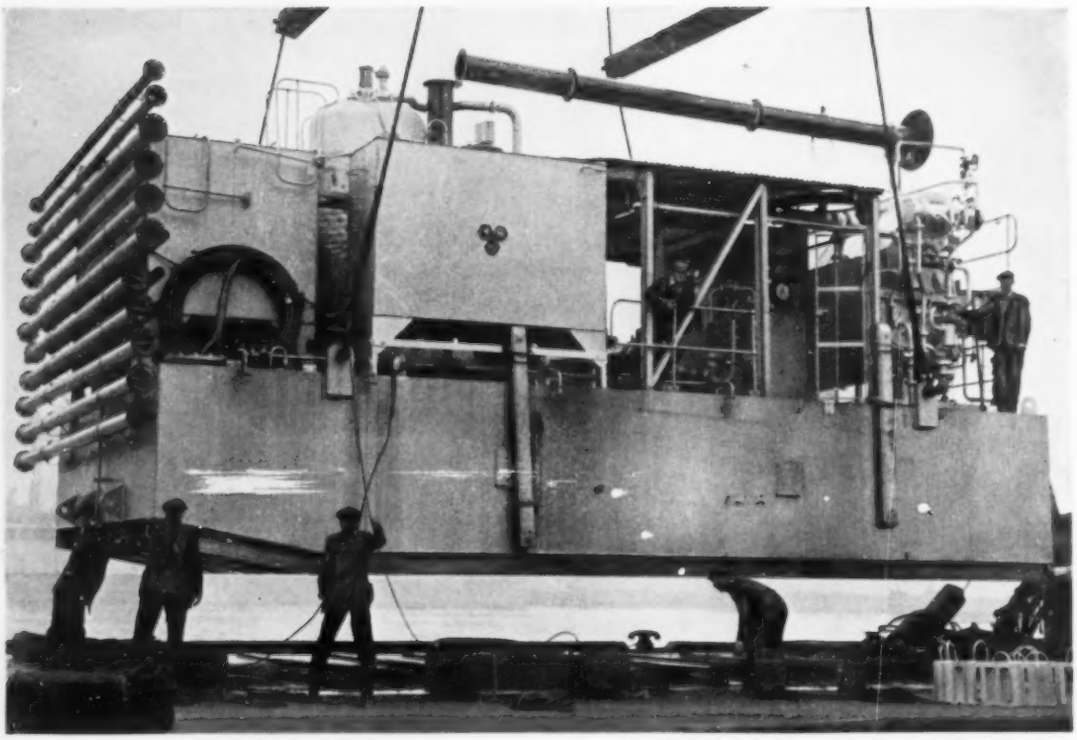

Packaged Fresh-Water Supply for Abu Dhabi

This is a packaged sea-water evaporator, believed to be the first of its kind, at the start of its long sea voyage to the Persian Gulf. It is now being commissioned and will provide drinking water for the Sheikdom of Abu Dhabi which, with no water supplies of its own, has had to ship it in by dhow at considerable expense.

The unusual feature of this 14,400 gallon per day evaporator is that the whole unit—which includes boiler, diesel generators and pumps—is built on its own water storage tank, which also acts as a pontoon. There are no port facilities at Abu Dhabi and the evaporator was towed inshore a distance of six miles, then, using its own winch, hauled itself up the beach and on to the concrete foundation prepared for it. When the sea-water supply pipes are connected and the fuel tanks filled, the evaporator will be ready to go to work.

Self-contained plants such as this can be built to any size which can be handled as a unit. They will operate on any normal fuel and the plant can be arranged, as this one is, to produce electric power to drive the ancillary equipment.

We pioneered the development of the vacuum flash evaporator in Great Britain and our experience in this highly specialized field is at your disposal.

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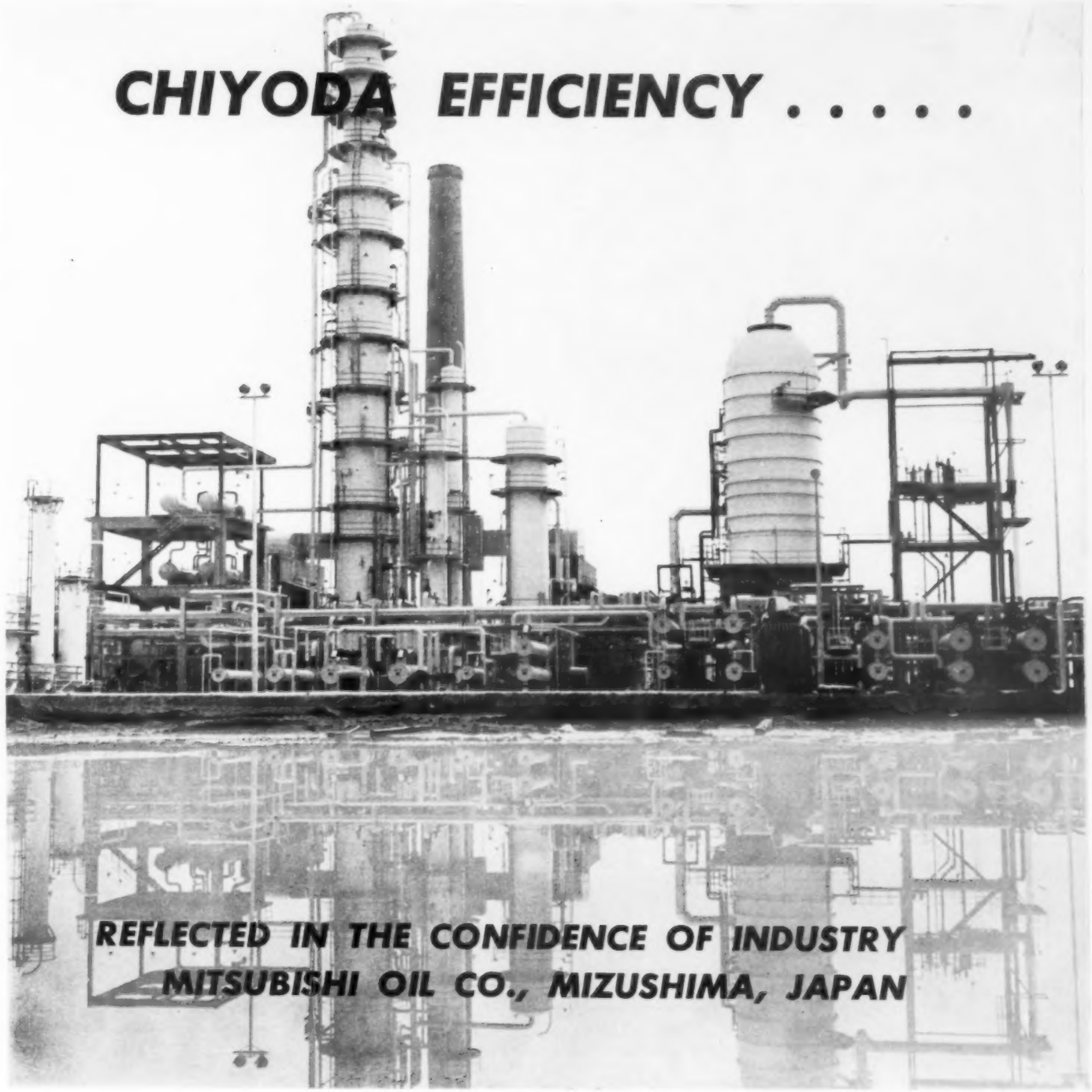
CHIYODA EFFICIENCY . . . . .



REFLECTED IN THE CONFIDENCE OF INDUSTRY
MITSUBISHI OIL CO., MIZUSHIMA, JAPAN

The engineer — whether mechanical, electrical, instrument, civic, architectural, metallurgical, welding — is known by the company he keeps . . . and the industries he builds. There are nine hundred engineers, all crack specialists, at Chiyoda of Japan.

As prime contractor, Chiyoda recently completed the first phase of Mitsubishi Oil Company's 2nd Refinery at Mizushima, Japan. It is currently working on the final phases.

Chiyoda engineers and draftsmen, Chiyoda researchers and Chiyoda developers — 1700 strong — are constantly planning cost-conscious efficiency for esteemed clients of industry both at home and abroad. In keeping with the times, emphasis is geared for chemical engineering and construction projects of international proportions and international significance.

CHIYODA CHEMICAL ENGINEERING & CONSTRUCTION CO., LTD.

Head Office: No.3, Marunouchi, 2-chome, Chiyoda-ku, Tokyo, Japan Cable Address: "CHIYOTAKA TOKYO"

A refinery is born

The first stirrings on the site of a refinery-to-be. The scene here is in Belfast, but it is typical of many other sites—in Europe, Africa (North, South, East and West) and the Middle East.

In sixteen widely separated places refineries are being planned or built or are undergoing major expansion by BP and its associates... tangible symbols of progress with British Petroleum.

BP

A. P. MOLLER. Copenhagen, Denmark.
Thermal cracking (oil pyrolisis plant only), 3,300 b/d.

DANISH SHELL has bought land at Frederica, 110 miles from Copenhagen, Denmark, as a possible refinery site. No further information has been disclosed, although reports indicate a possible $30 million plant.

DANSK MINERALOLIEFABRIK. Copenhagen S, Denmark. President, E. Windfeld-Hansen.
Crude capacity: Vacuum distillation 60 b/sd. Sulfuric acid treating. Grease manufacture, 3,000 lb/day.

DANSK VEEDOL (subsidiary of Tidewater Oil Co.) will complete a $24 million, 20,000 b/d refinery at Kalundborg in September, 1961. Contractors are Foster Wheeler Ltd and Soc. Fives-Penhoet. Process units include: atmospheric and vacuum distillation, catalytic reforming, hydrodesulfurizer, gasoline and kerosine treating.

GULF OIL CORP. will build a $19.6 million, 30,000 b/d refinery at Stigsnaes, Denmark, in southern Zealand, with completion expected by the end of 1962.

Finland

NESTE OY. Naantali, Finland. Plant manager, Mikko Tanner.
Crude capacity: 24,000 b/d. Vacuum distillation, 12,000 b/d. Thermofor catalytic cracking, 8,300 b/d (fresh feed). Atlantic Catforming, 3,400 b/d. Polymerization, 1,800 b/d. Caustic treating. Copper sweetening. Asphalt oxidation.
Planned: doubling of crude capacity, to 48,000 b/d. Completion date not disclosed.

France

ANTAR PETROLES DE L'ATLANTIQUE. Donges, France. Manager: Gaston Reymonenq.
Crude capacity: 78,000 b/d. Vacuum distillation, 1,000 b/d. Thermofor catalytic cracking, 12,000 b/d. Houdry catalytic reforming, 13,000 b/d. Hydrodesulfurization, 13,000 b/d. Udex, 5,000 b/d.

ANTAR PETROLES DE L'ATLANTIQUE. Merkwiller, France.
Crude capacity: 4,200 b/d. Solvent refining (lubes), 500 b/d.

CIE DE RAFFINAGE SHELL BERRE. Berre l'Etang, France. Mgr.: Maurice Avenard.
Crude capacity: 80,000 b/d. Thermal reforming, 11,800 b/d. Catalytic cracking, 12,800 b/d. Platforming, 14,000 b/d. Visbreaking, 5,300 b/d. Furfural refining, 3,500 b/d.
Under construction: catalytic reforming, 13,000 b/d.

CIE DE RAFFINAGE SHELL BERRE. Pauillac, France. Mgr.: Roger Aniel.
Crude capacity: 16,000 b/d.

CIE DE RAFFINAGE SHELL BERRE. Petit Couronne, France. Mgr.: H. Fabre.
Crude capacity: 94,000 b/d. Vacuum distillation, 21,400 b/d. Thermal cracking, 6,800 b/d. Platforming, 14,000 b/d. Catalytic cracking, 12,800 b/d. Desulfurization, 10,000 b/d. Solvent refining (lubes), 2,600 b/d.

CIE FRANCAISE DE RAFFINAGE. Gonfreville, France. Plant manager, Luc Bergeaud.
Crude capacity: 143,000 b/d. Visbreaking, 9,000 b/d. Thermal reforming, 19,000 b/d. Model IV Fluid catalytic cracking, 19,000 b/d. Polymerization, 5,900 b/d.
Under construction: Powerforming, 18,000 b/d.

CIE FRANCAISE DE RAFFINAGE. La Mede, France. Plant manager, M. J. Chieze.
Crude capacity: 130,000 b/d. Thermal cracking, 2,000 b/d. Thermal reforming, 17,000 b/d. Model IV Fluid catalytic cracking, 11,600 b/d. Powerforming, 20,000 b/d. Desulfurization, 12,500 b/d. UOP Hydrogenation, 1,200 b/d. Polymerization, 1,000 b/d.

CIE RHENANE DE RAFFINAGE (Shell Berre 85%, Union Industrielle des Petroles 10% and Mobil Oil Francaise SA 5%) will complete by early 1963 a 60,000 b/d refinery at Strasbourg, France.

ESSO STANDARD S.A.F. Bordeaux, France. Manager, J. Creusy.
Crude capacity: 35,000 b/d. Powerforming, 4,800 b/d.

ESSO STANDARD S.A.F. Port Jerome, France. Plant manager, L. Hemmer.
Crude capacity: 80,000 b/d. Thermal cracking, 4,500 b/d. Model IV Fluid catalytic cracking, 20,000 b/d. Powerforming, 11,900 b/d. Polymerization, 360 b/d. Solvent refining (lubes) 3,200 b/d.
Planned: Hydrofiner, 10,800 b/d.

ESSO STANDARD SAF is contemplating a refinery of undisclosed capacity in the Marseilles, France, area.

MOBIL OIL FRANCAISE S.A. Frontignan, France. Mgr.: P. Guillon.
Crude capacity: 34,600 b/d. Thermal reforming, 2,200 b/d. Catalytic cracking, 12,700 b/d. Catalytic reforming, 4,100 b/d. Desulfurization, 5,000 b/d.

MOBIL OIL FRANCAISE S.A. Gravenchon, France. Mgr.: E. Auger.
Crude capacity: 22,500 b/d. Thermal reforming, 2,300 b/d. Catalytic reforming, 3,900 b/d. Desulfurization, 5,000 b/d. Solvent refining (lubes) 2,800 b/d. Lube facilities are being expanded.

PECHELBRONN S.A.E.M. Merkwiller-Pechelbroon (Bhas-Rhin), France. Superintendent, Marc Butaud.
Crude capacity: 4,000 b/d. Vacuum distillation. Thermal reforming, 1,000 b/d. Coking. Acid Treating.

PETROFRANCE (Nahmias group) plans a $6 million, 20,000 b/d refinery at Fublaines, France, near the Coulommes field in the Paris basin, pending approval by the government.

SOCIETE FRANCAISE DE PETROLES B.P. Dunkirk, France. Manager, M. Ventajou.
Crude capacity: 60,000 b/d. Thermal reforming, 7,100 b/d. Catalytic reforming, 10,000 b/d. Alkylation, 2,000 b/d. Solvent refining (lubes), 2,000 b/d.

SOCIETE FRANCAISE DES PETROLES B.P. Lavera, France. Manager: P. Delchambre.
Crude capacity: 84,000 b/d. Thermal reforming, 5,400 b/d. Catalytic reforming, 6,100 b/d.
Under construction: asphalt capacity of 100,000 ton/yr. completion first half 1962.

SOC. DE LA RAFFINERIE DE STRASBOURG, S.A. (in which Soc. Francaise des Petroles B.P. has a one-third interest) will complete early in 1963 a $61.6 million, 66,000 b/d refinery including 14,000 b/d catalytic reforming at Herrlisheim, France, 15 miles north of Strasbourg. Other companies involved are Cie. Francaise de Raffinage and Antar.

UNION INDUSTRIELLE DES PETROLES. Bec d'Ambes, France, formerly Caltex refinery, in which the government firm has purchased a 60% share.
Crude capacity: 26,000 b/d. Thermal reforming, 4,300 b/d. Catalytic cracking, 4,600 b/d. Polymerization, 400 b/d.

Germany (West)

B. P. BENZIN UND PETROLEUM A.G. Dinslaken, West Germany.
Crude capacity: 90,000 b/d. Vacuum distillation, 17,500 b/d. Fluid catalytic cracking, 10,000 b/d. Platforming, 10,000 b/d. Asphalt, 3,000 b/d.

B. P. BENZIN UND PETROLEUM A.G. Hamburg-Finkenwerder, West Germany. Plant manager, Direktor C. Piefke.
Crude capacity: 43,000 b/d. Vacuum distillation, Thermal cracking, 7,600 b/d. Platforming, 6,000 b/sd. Hydrofining (Uhde), 6,500 b/sd. Doctor and Solutizer treating. Asphalt. Sulfur recovery.

CALTEX plans a $50 million, 40,000 b/d refinery in the Frankfurt, West Germany, area, with completion at the end of 1963. Caltex and Farbwerke Hoechst have signed a long term agreement on supply of petrochemicals from the refinery.

DEUTSCHE ERDOEL A.G. Heide/Holstein, West Germany. Plant manager, Dr. Koehler.
Crude capacity: 31,500 b/sd. Vacuum distillation, 8,520 b/sd. Thermofor catalytic cracking, 7,620 b/sd. Platforming-Unifining, 4,000 b/sd. Shell Trickle desulfurization, 8,100 b/sd. Polymerization, 380 b/sd. Solvent refining (lubes), 1,500 b/d.
Expansion in crude capacity to 50,000 b/d is planned for 1963.

DEUTSCHE ERDOEL A.G. Wietz-Celle, West Germany.
Crude capacity: 800 b/d.

DEUTSCHE SHELL A.G. Godorf, West Germany.
Crude capacity: 55,000 b/d. Catalytic reforming, 6,700 b/d. Desulfurization.
New refinery, completed in July, 1960.
Long range planning indicates this refinery may eventually reach a capacity of 80,000 b/d.

DEUTSCHE SHELL A.G. Hamburg, West Germany.
Crude capacity: 60,000 b/d. Catalytic cracking, 12,000 b/d. Catalytic reforming, 9,000 b/d. Desulfurization, 10,800 b/d. Polymerization, 1,200 b/d. Lube production, 3,200 b/d.

DEUTSCHE SHELL A.G. Monheim, West Germany.
Crude capacity: 6,000 b/d. Lube production, 1,200 b/d.

DEUTSCHE SHELL A.G. will complete a 40,000 b/d refinery on a 333-acre site near Ingolstadt, Bavaria, West Germany, in 1963.

ENTE NAZIONALE IDROCARBURI, the Italian government oil agency, in joint enterprise with German banks, has indicated plans for a 40,000 b/d refinery in the Stuttgart, West Germany, area with completion date not disclosed.

ESSO A.G. Cologne, West Germany.
Crude capacity: 68,000 b/d. Powerforming, 6,900 b/d. Hydrofining, 12,300 b/d.

ESSO A.G. Hamburg, West Germany.
Crude capacity: 50,400 b/d. Model IV Fluid catalytic cracking, 10,500 b/d. Powerforming, 7,000 b/d. Hydrofining, 7,600 b/d. Lube production, 1,400 b/d.

ESSO A.G. Karlsruhe, West Germany.
A new 70,000 b/d refinery is being built at Karlsruhe, with completion expected in January, 1963.

ESSO A.G. has long-term plans to build a new refinery in Bavaria.

FRISIA A.G. Emden, West Germany.
Crude capacity: 28,000 b/d. SBK Catalytic reforming, 4,000 b/d.
New $17 million plant, completed in 1960. Ralph M. Parsons Co. was contractor.

GELSENBERG BENZIN A.G. Gelsenkirchen-Horst, West Germany. Plant manager, Dr. Wilhelm Becker.
Crude capacity: 90,000 b/d. Vacuum distillation, 11,500 b/d. Thermofor catalytic cracking, 10,000 b/d. Platforming, 18,000 b/d. Hydrogen processing, 13,300 b/d. Polymerization, 530 b/d.

GEWERKSCHAFT ERDOEL-RAFFINERIE DEURAG-NERAG. Misburg, near Hannover, West Germany. Plant manager, Dr. Hans Weller.
Crude capacity: 29,000 b/d. Vacuum distillation, 9,000 b/d. Thermal cracking, 5,700 b/d. Platformer Unifiner, 3,000 b/d. Shell Trickle desulfurization, 3,750 b/d. Polymerization, 1,450 b/d. Texaco dewaxing, 1,400 b/d. Edeleanu dewaxing, 1,600 b/d. Furfural refining, 1,850 b/d. Deasphalting, 1,400 b/d.

GEWERKSCHAFT ERDOEL-RAFFINERIE EMSLAND. Lingen-Emsland, West Germany. President, Dr. Josef Rust.
Crude capacity: 55,000 b/d. Catalytic cracking, 8,900 b/d. Catalytic reforming 3,000 b/d. Polymerization, 800 b/d. Hydrodesulfurization.

GEWERKSCHAFT GREIFF BERGBAU MINERALOEL RAFFINERIE. Dollbergen, West Germany.
Crude capacity: 500 b/d.

KLEINHOLZ & CO. Essen, West Germany.
Crude capacity: 400 b/d.

MINERALOEL UND ASPHALTWERKE A.G. Ostermoor-Holstein, West Germany. Manager, Dr. Richard Ladwig.
Crude capacity: 5,000 b/d.

MINERALOELWERKE PEINE. Peine, West Germany.
Crude capacity, 400 b/d.

MOBIL OIL A.G. Bremen, West Germany. Plant manager, H. D. Rueschmann.
Crude capacity: 28,600 b/d. Catalytic cracking, 8,000 b/d. Catalytic reforming, 4,100 b/d. Catalytic desulfurization, 5,500 b/d. Duosol refining, 1,600 b/d. MEK dewaxing, 1,000 b/d.

MOBIL OIL A.G., along with Gelsenberg Benzin A.G. and BV-Aral, has indicated long-term plans to build a refinery in Bavaria.

OBERRHEINISCHE MINERALOELWERKE GmbH (Deutsche Erdoel 25%, Gelsenberg Benzin 22½%, Mobil Oil AG 22½%, Wintershall AG 15%, and Scholven-Chemie 15%) plans a 40,000 b/d refinery in the Karlsruhe, West Germany area, with completion in 1963.

OELWERKE JULIUS SCHINDLER GmbH. Hamburg-Wilhelmsburg, West Germany. Plant manager, Dr. Otto Stuermann.
Crude capacity: 4,200 b/d. Vacuum distillation, 1,100 b/d. Sodium type desulfurization, 450 b/d.

Furfural solvent extraction, 1,500 b/d. Sulfuric acid treating, 1,500 b/d. Solvent extraction, 1,900 b/d.

Under construction: 2,000 b/d, $4.76 million Edeleanu dewaxing unit, to be completed in 1961.

OELWERKE JULIUS SCHINDLER GmbH. Peine-Hanover, West Germany.

A lube plant of 700 b/d (no crude stills).

PURFINA MINERALOELRAFFINERIE A.G. Duisburg-Neuenkamp, West Germany. General manager, Dr.-Ing. Herbert J. Kimmerle.

Crude capacity: 20,000 b/d. Platforming and Unifining, 3,600 b/d. HDS-Trickle desulfurization, 3,300 b/d. Copper chloride treating.

Expansion in crude capacity to 28,000 b/d is planned for 1961.

RUHRBAU MINERALOELRAFFINERIE GmbH. Muelheim (Ruhr)-Speldorf, West Germany. General Manager, Dr.-Ing. Herbert J. Kimmerle.

Crude capacity: 6,100 b/d. Vacuum distillation. Principal product, asphalts.

RUHRCHEMIE A.G. Oberhausen-Holten, West Germany. Plant manager, Mr. Knoellinger.

Crude capacity: 10,000 b/d. Thermofor catalytic cracking, 3,000 b/d. Platforming, 2,000 b/d. Unifining, 3,800 b/d.

SCHOLVEN CHEMIE A.G. Gelsenkirchen-Buer, West Germany.

Crude capacity: 50,000 b/d. Catalytic cracking, 4,700 b/d. Catalytic reforming, 9,900 b/d. Hydrogen processing, 8,800 b/d. Polymerization, 200 b/d.

SUEDPETROL AG (owned 50% by Italian state company ENI and 50% by German banks) will build a 60,000 b/d refinery at Ingolstadt, Bavaria, West Germany, with completion in 1963. Long range plans are to double capacity.

TIDEWATER OIL interests are considering construction of a 40,000 b/d refinery in the heart of the Bavarian industrial region of West Germany.

UNION RHEINISCHE BRAUNKOHLEN KRAFTSTOFF A.G. Wesseling-Cologne, West Germany. Managing directors, Dr. K. Wissel and Dr. W. Wiebourg.

Crude capacity: 65,000 b/sd. Vacuum distillation. Thermal cracking, 12,000 b/sd. Thermal reforming, 6,000 b/sd. Platforming, 6,750 b/sd. Crude oil hydrogenation, 9,500 b/sd. Polymerization, 500 b/sd.

WINTERSHALL A.G. Salzbergen, West Germany. President, Dr. Josef Rust.

Crude capacity: 4,500 b/d. Principal products, lube oils, paraffin, asphalt.

Greece

"ELBYN" LUBRICATING OIL CO. LTD. Moshaton, Athens, Greece. Plant manager, S. Kotsiopoulos.

Crude capacity (vacuum distillation): 400 b/d. Solvent dewaxing, Furfural extraction, sulfuric acid and clay treating.

HELLENIC PETROLEUM REFINING CO. Athens, Greece. Superintendent: Carl S. Nelson.

Crude capacity: 40,000 b/d. Vacuum distillation, 2,000 b/d. Atlantic Catforming, 8,000 b/d. Copper treating for kerosine and jet fuels. LPGas recovery.

Ireland (Eire)

IRISH REFINING CO. LTD. Whitegate, Cork, Ireland. Plant manager: Ian McCallum.

Crude capacity: 41,700 b/sd. Powerforming, 9,000 b/sd. Esso hydrodesulfurization (for diesel oil), 6,100 b/sd. Copper sweetening, 3,000 b/sd.

Italy

A.B.C.D. (ASFALTI BITUMI-CATRAMIE DERIVATE). Ragusa, Sicily, Italy.

Crude capacity: 4,800 b/d.

A.G.I.P. MINERARIA Spa. Cortemaggiore (near Cremona), Italy.

Crude capacity: 3,000 b/d. Catalytic cracking, 3,000 b/d.

A.G.I.P. MINERARIA Spa. Gela, Sicily, Italy.

Crude capacity: 2,500 b/d.

ANIC-GELA, a new ENI company, will complete in 1964 a refining-petrochemical complex at Gela, Sicily, Italy. Anticipated investment in the 60,000 b/d refinery is 49 billion Lira ($78 million). An associated power station to operate on petroleum coke will cost 16 billion Lira ($25 million). Planned product output in addition to coke: LPG, 55,000 ton/yr.; gasoline and light distillates, 8,400 b/d; fuel oil, 9,400 b/d.

ANOMINA PETROLI ITALIANA. Falconara Marittima, near Ancona, Italy. Plant manager, Enrico Calabria.

Crude capacity: 45,000 b/d. Vacuum distillation, 10,500 b/d. Thermal cracking, 7,500 b/d. Thermal reforming, 3,375 b/d. Platforming, 3,000 b/d. Bauxite desulfurizing, 1,025 b/d. Doctor and acid treating, 9,750 b/d.

ANIC, a member of the ENI Group, has been authorized by the Italian government to build a new 40,000 b/d refinery in the Po Valley of Italy. Completion date and site not disclosed.

AQUILA (SOCIETA PER AZIONI TECNICO-INDUSTRIALE). Trieste, Italy.

Crude capacity: 44,000 b/d. Thermal reforming, 3,000 b/d. Catalytic cracking, 6,300 b/d. Catalytic reforming, 5,000 b/d. Desulfurization, 5,000 b/d. Polymerization, 1,400 b/d. Lubes, 900 b/d.

CONDOR SpA. PETROLIFERA & CHIMICA (SHELL). Rho, near Milan, Italy.

Crude capacity: 49,400 b/d. Catalytic cracking, 15,000 b/d. Catalytic reforming, 5,100 b/d. Desulfurization, 6,000 b/d.

Expansion of crude capacity to 80,000 b/d is being planned.

DELLA PIANE RAFFAELE. Genoa, San Quirico, Italy.

Crude capacity: 1,200 b/d. Catalytic reforming, 400 b/d.

Plant is not operating.

D.I.C.A. (DISTILLERIA ITALIANA CATRAMI). Massa, near Carrara, Italy.

Crude capacity: 7,000 b/d. Thermal cracking, 500 b/d. Catalytic reforming, 400 b/d.

ESSO STANDARD ITALIANA. Trieste, Italy. Plant manager, O. Camus.

Crude capacity: 4,500 b/d. Vacuum distillation, 1,450 b/d. Powerforming, 800 b/d. Treating, 2,270 b/d. Asphalt oxidation, 100 b/d.

ESSO STANDARD ITALIANA expects to complete in 1963 a 4,000 b/d solvent extraction lube oil unit at Augusta, Sicily, near the RASIOM refinery.

EDOARDO GARRONE. Genoa-San Quirico, Italy.

Crude capacity: 35,000 b/d. Powerforming, 5,600 b/d. Hydrofining, 5,000 b/d.

Expansion of crude capacity to 80,000 b/d has been approved by Italian government.

GETTY OIL ITALIANA Spa. Piana de Arzano, Gaeta, Italy. Plant manager, Luigi Togliani.

Crude capacity: 40,000 b/d. Platforming, 3,000 b/d. Unifining.

I.C.I.P. (INDUSTRIE CHIMICHE ITALIANE DEL PETROLIO). Mantua, Italy.

Crude capacity: 18,000 b/d. Thermal cracking, 5,400 b/d. Catalytic reforming, 2,500 b/d.

I.L.S.E.A. (INDUSTRIA LEGANTI STRADALI ed AFFINI). Como, Italy.

Crude capacity: 1,800 b/d. Catalytic reforming, 600 b/d.

I.N.P.E.T. (SOCIETA PER L'INDUSTRIA ITALIANA DEL PETROLIO). La Spezia, Italy.

Crude capacity: 40,000 b/d. Thermal reforming, 3,000 b/d. Catalytic reforming, 6,700 b/d.

Expansion of crude capacity to 80,000 b/d has been authorized by the Italian government.

I.P.I.O.M. (INDUSTRIA PIEMONTESE LAVORAZIONE OLII MINERALI). Genoa, Italy. Manager: Aldo Pontremoli.

Crude capacity: 10,600 b/d. Catalytic reforming, 1,100 b/d. Desulfurization, 1,000 b/d. Doctor sweetening.

I.R.O.M. (INDUSTRIA RAFFINAZIONE OLII MINERALI). Porto Marghera (Venice), Italy.

Crude capacity: 39,000 b/d. Thermal cracking, 700 b/d. Thermal reforming, 7,300 b/d. Catalytic reforming, 2,000 b/d. Desulfurization, 6,500 b/d. Polymerization, 1,600 b/d. Lubes, 300 b/d.

Under construction: 4,000 b/d catalytic reformer, for completion mid-1961.

I.S.I.O.M. (INDUSTRIE SICILIANE LAVORAZIONE OLII MINERALI). Palermo, Sicily, Italy.

Crude capacity: 9,000 b/d. Catalytic reforming, 1,400 b/d.

"ITALIA" RAFFINERIA DI PETROLIO. Cremona, Italy.

Crude capacity: 8,000 b/d. Thermal cracking, 800 b/d. Thermal reforming, 2,600 b/d. Catalytic reforming, 900 b/d.

Plant has been purchased by Indiana Standard for $14.5 million. Amoco Italia will be the operating company, and is considering expansion to 40,000 b/d.

LOMBARDA PETROLI S.A. Villasanta (near Monza and Milan) Italy.

Crude capacity 4,000 b/d. Thermal reforming, 800 b/d.

MOBIL OIL ITALIANA. Naples, Italy.

Crude capacity: 85,000 b/d. Thermal reforming, 7,100 b/d. Catalytic cracking, 13,500 b/d. Catalytic reforming, 12,000 b/d. Desulfurization, 10,000 b/d. Polymerization, 900 b/d. Solvent refining (lubes), 2,700 b/d.

MONTECATINI. Ferrara, Italy.

Crude capacity: 4,000 b/d.

RAFFINERIA NILO Spa. Milan, Italy.

Crude capacity: 7,000 b/d. Catalytic reforming, 900 b/d.

PETROLI D'ITALIA SpA. Fiorenzuola (between Parma and Piaceuza), Italy.

Crude capacity: 5,400 b/d. Thermal cracking, 2,000 b/d. Thermal reforming, 800 b/d.

Plant is not operating.

PURFINA ITALIANA. Florence, Italy.

Crude capacity: 4,400 b/d. Thermal reforming, 700 b/d.

Plant is not operating.

PURFINA ITALIANA SpA. Genoa- Bolzaneto, Italy. Plant manager, V. Pessarelli.

Crude capacity: 11,000 b/d. Thermofor catalytic cracking, 1,500 b/d. Platforming, 1,100 b/d. Perco desulfurization, 1,000 b/d. Treating.

Planned: expansion of crude capacity to 11,400 b/d.

PURFINA ITALIANA SpA. Milan, Italy. Plant manager, M. Cesana.

Crude capacity: 4,500 b/d. Vacuum distillation, 3,000 b/d. Perco reforming, 500 b/d. Treating.

PURFINA ITALIANA SpA. Rome, Italy. Plant manager, A. Simonetti.

Crude capacity: 11,000 b/d. Thermofor catalytic cracking, 1,500 b/d. Perco reforming, 500 b/d. Perco desulfurization, 1,000 b/d. Treating.

Planned: expansion of crude capacity to 30,000 b/d.

R.A.S.I.O.M. (RAFFINERIA SICILIANA OLII MINERALI). Augusta, Sicily, Italy. Manager, Aldo Sala.

Crude capacity: 130,500 b/d. Vacuum distillation, 5,000 b/d. Thermal cracking, 10,000 b/d. Thermal reforming, 8,000 b/d. Powerforming, 8,000 b/d. Polymerization, 1,700 b/d. Diesel oil desulfurization, 3,500 b/d. Treating.

R.O.L. (RAFFINERIA OLII LUBRIFICANTI). Vigguzolo, near Alessandria, Italy.

Crude capacity: 1,500 b/d. Solvent refining, 400 b/d.

S.A. MEDITERRANEA RAFFINERIA SICILIANA PETROLI will complete in September of this year a 52,000 b/d refinery at Milazzo, Sicily, Italy, including 15,000 b/d visbreaking and 20,000 b/d catalytic reforming.

Planned: capacity increase to 100,000 b/d.

SARDA INDUSTRIE RESINE SpA (SIR) has obtained government authorization to build a 24,000 b/d refinery and associated petrochemical facilities at Porto Torres, Sardinia, Italy.

S.A.R.P.O.M. (SOCIETA PER AZIONI RAFFINERIA PADANA OLII MINERALI). Trecate, near Novara, Italy.

Crude capacity: 27,000 b/d. Vacuum distillation, 12,000 b/d. Thermal reforming, 3,900 b/d. Catalytic cracking, 5,000 b/d. Polymerization, 1,000 b/d.

Plant has been taken over by Esso Standard Italiana and plans have been indicated that crude capacity is to be doubled.

SOC. ALGHERESE INDUSTRIE CHIMICHE AGRICOLA (SAICA) has received government approval to build a 24,000 b/d refinery at Porto Torres, Sardinia, Italy.

SOC. CLASA will build a 30,000 b/d refinery at Civitavecchia, Italy. Project has been approved by the Italian government. No completion date was reported.

SOC. MEDITERRANEA PETROLI has received

government approval to construct a new 20,000 b/d refinery at Olbia, Sardinia, Italy. No complete date was indicated.

SpA EDISON plans to build a new 60,000 b/d refinery at an undisclosed site in northern Italy, to be linked by pipeline to Genoa. Project has been authorized by the Italian government.

SpA. SANQUIRICO. Genoa, San Quirico, Italy. Plant manager, Maurizio Pagliano.
Crude capacity: 4,000 b/d. Platforming, 2,000 b/d. Perco desulfurization, 1,000 b/d.
Company has purchased 10,000 b/d Elsie, Mich. refinery of Aurora Gasoline Co. and is now re-erecting it at Genoa.

S.A.R.O.M. (SOCIETA AZIONARIA RAFFINAZIONE OLII MINERALI). Ravenna, Italy. General manager, Bruno Riffezer.
Crude capacity: 60,000 b/d. Thermal reforming, 4,500 b/d. Houdriforming, 4,000 b/d. Lurgi desulfurization, 14,000 b/d. Hypochlorite treating, 20,000 b/d. Sulfur, 34 ton/day.

S.I.R.O.M. (SOCIETA INDUSTRIA RAFFINERIA OLII MINERALI). Monza, near Milan, Italy.
Crude capacity: 1,300 b/d.

S.P.I. (SOCIETA PETROLIFERA ITALIANA). Fornovo, Italy (near Parma).
Crude capacity: 3,000 b/d. Catalytic reforming, 900 b/d.

STANIC INDUSTRIA PETROLIFERA. Via Bruno Buozzi, Bari, Italy. Plant manager, Mariano Campos.
Crude capacity: 46,300 b/d. Powerforming, 6,500 b/d. Hydrofining, 6,150 b/d. Treating processes, total 17,700 b/d.
Planned: expansion of crude capacity to 90,000 b/d. Government has granted approval.

STANIC INDUSTRIA PETROLIFERA. Livorno, Italy. Plant manager, Giovanni Garone.
Crude capacity: 44,600 b/d. Thermal reforming, 3,700 b/d. Fluid hydroforming, 8,000 b/d. Hydrofining, 6,800 b/d. Duo-Sol extraction, 3,000 b/d. Phenol extraction, 2,900 b/d. Treating processes, total 15,500 b/d. Propane dewaxing, 2,150. Clay contacting, 1 750 b/d. Wax production, 11,500 ton/year.

STOI. Florence, Italy.
Crude capacity: 17,000 b/d. Thermal reforming, 1,000 b/d. Catalytic reforming, 2,500 b/d.

DOTT G. VOLPATO & CO. Milan, Italy. Managing director, Dr. Angelo Volpato.
Crude capacity: 2,100 b/sd. Perco desulfurization, 320 b/sd.
Plant is not operating.

Netherlands

CALTEX PETROLEUM MIJ. Rotterdam, The Netherlands. Plant manager, W. James.
Crude capacity: 59,000 b/sd. Vacuum distillation, 36,000 b/sd. Thermal cracking, 9,000 b/sd. Thermal reforming, 7,500 b/sd. Platformer, 7,500 b/sd. Naphtha Unifiner, 7,500 b/sd. Diesel Unifiner, 4,500 b/sd. Polymerization, 3,000 b/sd (feed). Treating processes, 15,700 b/sd. Sulfur recovery, 12 ton/day.

ESSO NEDERLAND N.V. Rotterdam, Netherlands.
Crude capacity: 100,000 b/d. Powerforming, 16,000 b/d. Catalytic desulfurization.
New $50 million refinery, completed late in 1960.

SHELL PERNIS RAFFINADERIJ N.V. Pernis, Netherlands.
Crude capacity: 300,000 b/d. Thermal cracking, 20,000 b/d. Thermal reforming, 10,000 b/d. Catalytic cracking, 77,000 b/d. Catalytic reforming, 12,700 b/d. Alkylation, 2,500 b/d. Desulfurization, 21,800 b/d. Polymerization, 4,700 b/d. Lube production, 2,900 b/d.

Norway

A/S ESSO RAFFINERIET NORGE. Slagen, Norway.
Crude capacity: 40,000 b/d. Powerforming, 6,000 b/d.

Portugal

S.A.C.O.R. Cabo Ruivo, Lisbon, Portugal.
Crude capacity: 29,000 b/d. Catalytic cracking, 11,000 b/d. Polymerization, 190 b/d. Lube production, 600 b/d. (Edeleanu Unit). Asphalt oxidation.
Expansion in crude capacity to 30,000 b/d to be completed in 1962.
S.A.C.O.R. plans a new 20,000 b/d refinery at Oporto, Portugal, for completion about 1963.

Spain

CIA. ESPANOLA DE PETROLEOS S.A. (CEPSA). Santa Cruze de Teneriffe, Canary Islands, Spain.
Crude capacity: 60,000 b/d. Vacuum distillation, 2,500 b/sd. Thermal cracking, 2,500 b/sd. Platforming, 5,000 b/sd. Solvent processes, Doctor sweetening.
Expansion of crude capacity to 110,000 b/d and a new 15,000 b/d catalytic reformer, due for completion late this year, at cost of $15 million. Project also includes Edeleanu kerosene treater, 3,500 b/d, and a new power plant.

EMPRESA NACIONAL CALVO SOTELO S.A. (ENCASO), subsidiary of Spanish State company INI plans a 30,000 b/d, $15 million, conventional crude refinery adjacent its shale oil plant at Puertollano, Spain. Project includes a new 280-km pipeline from Malaga, at an additional cost of $14 million.

OHIO OIL CO. and its Spanish associates have been granted government approval to build a $14 million, 26,500 refinery in northern Spain. Site has not yet been selected. Ohio will bear 84% of construction cost. Final ownership, established by terms of government permission, will be: Spanish government, 52%; Ohio Oil 28%; its Spanish associates, 16%; and Cia. Iberica de Petroles S.A., 4%.

PETROLEOS DE GALICIA plans a $15 million 24,000 b/d refinery at Vigo, Spain.

REFINERIA DE PETROLEOS DE ESCOMBRERAS S.A. (REPESA). Escombreras, Spain.
Crude capacity: 86,500 b/d. Thermal reforming, 9,000 b/d. Catalytic reforming, 11,000 b/d. Polymerization, 1,600 b/d. Solvent refining (lubes), 500 b/d.

Sweden

AXEL JOHNSON & CO. Nynashamn, Sweden.
Crude capacity: 2,400 b/d. Scheduled for expansion to 3,600 b/d. in 1963.

KOPPARTRANS OLJEAKTIEBOLAG. Skarvik, Sweden. General manager, P. Betts.
Crude capacity: 40,000 b/d. Thermal reforming, 4,000 b/d. Catalytic reforming, 5,000 b/d. Desulfurization, 7,200 b/d. Catalytic reformer is being revamped to Platforming.

AB NYNAS-PETROLEUM. Gothenburg, Sweden.
Crude capacity: 3,000 b/sd. Vacuum distillation, 2,300 b/sd.

AB NYNAS-PETROLEUM. Malmo, Sweden.
Crude capacity: 1,900 b/sd. Vacuum distillation, 1,500 b/sd.

AB NYNAS-PETROLEUM. Nynashamn, Sweden.
Crude capacity: 20,000 b/sd. Vacuum distillation, 4,500 b/sd. Thermal reforming, 1,900 b/sd. Platforming, 6,800 b/sd.

SWEDISH SHALE OIL CO. (SVENSKA SKIFFEROLJE AKTIEBOLAGET), Narkes Kvarntorp, Sweden. Plant superintendent: Gosta Salomonsson.
Crude capacity (shale oil, not crude petroleum); 2,000 b/d. Sulfuric acid treating, 2,000 b/d. Products: gasoline, fuel oil, liquefied gases.

Switzerland

ITALO-SUISSE/E.N.I. has indicated plans for building a refinery at Aigle, Switzerland. Possible capacity 40,000 b/d. It is to be fed by pipeline from Genoa via the Great St. Bernard's pass. Work has begun on the pipeline.

MARANCO. S.A. Mendrisio, Switzerland.
Capacity: 300 to 400 b/d. Products primarily lubricating oils.

United Kingdom

BERRY WIGGINS & CO. LTD. Kingsnorth-on-Medway, near Rochester, Kent, England. Plant manager, W. J. Grant.
Crude capacity: 3,200 b/d. Vacuum distillation, 2,000 b/d.

BERRY WIGGINS & CO. LTD. Weaste refinery, Eccles New Road, Salford, Lancashire, England. Plant manager, A. E. Tonge.
Crude capacity: 2,200 b/d. Vacuum distillation, 1,700 b/d.

WILLIAM BRIGGS & SONS LTD. Dundee, Scotland, United Kingdom. Refinery manager, Henry A. Watson.
Crude capacity: 1,500 b/d. Vacuum distillation.

B. P. REFINERY (GRANGEMOUTH) LTD. Grangemouth, Scotland, United Kingdom.
Crude capacity: 67,000 b/d. Catalytic cracking, 11,300 b/d. Desulfurization, 500 b/d. Polymerization, 700 b/d.

B. P. REFINERY (KENT) LTD. Isle of Grain, Kent, United Kingdom.
Crude capacity: 180,000 b/d. Thermal reforming, 10,800 b/d. Catalytic cracking, 11,300 b/d. Catalytic reforming, 14,400 b/d. Alkylation, 2,250 b/d. Desulfurization, 18,000 b/d. Solvent refining (lubes), 2,500 b/d.
Under construction: a 23,000 b/d catalytic reformer, for completion early in 1962.

B. P. REFINERY (LLANDARCY) LTD. Llandarcy, Wales, United Kingdom.
Crude capacity: 63,000 b/d. Catalytic cracking, 11,300 b/d. Catalytic reforming, 5,400 b/d. Desulfurization, 3,200 b/d. Solvent refining (lubes), 1,800 b/d.

BRITISH PETROLEUM will complete Northern Ireland's first refinery in 1963. At Belfast, it will be a 26,000 b/d facility costing about $22.4 million.

ESSO PETROLEUM CO. LTD. Fawley, Hampshire, England. Refinery manager, Dr. F. Mayo.
Crude capacity: 230,000 b/d. Vacuum distillation, 69,500 b/d. Thermal cracking, 5,400 b/d. Fluid catalytic cracking, 46,000 b/d. Powerforming, 32,500 b/d. Hydrofining, 26,500 b/d. Polymerization, 4,000 b/d. Propane deasphalting, 4,000 b/d. Propane dewaxing, 2,300 b/d, Phenol treating, 8,500 b/d. Edeleanu plant, 15,000 b/d. Sweetening, total 87,500 b/d. Sulfur recovery, 20,000 long ton/year.

ESSO PETROLEUM CO. LTD. Milford Haven, Wales, England. Refinery manager, E. Asquith.
Crude capacity: 95,000 b/d. Powerforming, 16,500 b/d. Hydrofining, 16,500 b/d. Copper sweetening, 21,000 b/d.

IMPERIAL CHEMICAL INDUSTRIES LTD. will enter the petroleum refining field with a new 20,000 b/d refinery it plans at River Tees, England, mainly to supply naphtha to its olefin plants at Wilton.

LOBITOS OILFIELDS LTD., Ellesmere Port, Cheshire, England. Plant manager, A. Cluer.
Crude capacity: 2,500 b/d. Vacuum distillation. Thermal cracking, 1,300 b/d. Platformer, 800 b/d. Solvent processes, 1,150 b/d. Treating, 500 b/d. Sulfonation unit, 150 b/d. Wax, 50 b/d.

MANCHESTER OIL REFINERY (LOBITOS OILFIELDS LTD.) Trafford Park, Manchester, 17, England. General manager, J. C. Wood-Mallock.
Crude capacity: 3,500 b/d. Solvent refining (lubes), 2,000 b/d. Sulfonates, technical and medicinal white oil, 300 b/d.

MOBIL OIL CO. LTD. Coryton, near Stanford-le-Hope, Essex, England. Refinery manager, J. W. Bartholomew.
Crude capacity: 42,000 b/sd. Vacuum distillation, 21,000 b/sd. Thermofor catalytic cracking, 10,500 b/d. Platinum type catalytic reforming, 4,500 b/sd. Propane deasphalting, 7,200 b/sd. Furfural treating, 7,600 b/sd. MEK dewaxing, 3,600 b/sd. Treating processes, 14,000 b/sd. Thermofor continuous percolation, 2,800 b/sd.
Under construction: expansion in crude capacity by 15,000 b/d, with completion early in 1962. M. W. Kellogg has the contract.

SCOTTISH OILS LTD. Pumpherston, Scotland, United Kingdom. Plant manager, F. M. Cook.
Crude capacity: 3,200 b/d. Thermal cracking, 1,400 b/d. Coking, 5,000 long ton/yr. Wax extraction and refining, 12,000 long ton/yr.

SHELL REFINING CO. LTD. Shellhaven, Essex, United Kingdom.
Crude capacity: 160,000 b/d. Thermal reforming, 13,000 b/d. Catalytic reforming, 6,700 b/d. Hydrodesulfurization, 16,000 b/d. Solvent refining (lubes), 2,400 b/d. Asphalt blowing, 300-600 ton/day.

SHELL REFINING CO. LTD. Stanlow, Cheshire, United Kingdom.
Crude capacity: 105,000 b/d. Thermal reforming, 13,000 b/d. Catalytic cracking, 35,000 b/d. Catalytic reforming, 10,000 b/d. Desulfurization, 4,400 b/d. Polymerization, 2,000 b/d. Solvent refining (lubes), 3,900 b/d.
Planned: 6,700 b/d Platformer, by 1963.

SHELL REFINING CO. LTD. Heysham, Lancashire, United Kingdom.
Crude capacity: 36,000 b/d. Thermal reforming, 4,000 b/d. Visbreaking, 6,000 b/d.

STARHAVEN REFINERIES LTD. Ardrossan, Scotland, United Kingdom.
Crude capacity: 3,200 b/d.

Yugoslavia

RAFINERIJA NAFTE BOSANSKI BROD (Yugoslav government) Bosanski Brod, Yugoslavia.
Crude capacity: 20,000 b/d. Thermal cracking, 2,400 b/d. Lubes, 400 b/d.

RAFINERIJA NAFTE "BORIS KIDRIC" (Yugoslav government) Rijeka, Yugoslavia.
Crude capacity: 8,600 b/d. Solvent refining, 800 b/d.

RAFINERIJA NAFTE SISAK (Yugoslav government) Sisak, Yugoslavia. Plant manager, Karo Krajner.
Crude capacity: 10,300 b/d. Vacuum distillation, 3,600 b/d. Catalytic cracking, 2,000 b/d. Treating.
Planned: expansion of crude capacity to 20,000 b/d, plus catalytic reforming.

YUGOSLAV GOVERNMENT plans a refinery at Zadar, on the Dalmatian coast, with an initial capacity of 8,000 b/d. to be increased later by stages to 24,000 b/d.

YUGOSLAV GOVERNMENT has indicated plans for a 23,000 b/d refinery at Pancevo, near Belgrade, for completion about 1965.

Africa

Algeria

SOCIETE DE LA RAFFINERIE D'ALGER, Maison Carree (near Algiers), Algeria, plans a new 50,000 b/d, $40 million refinery, with completion in 1963. This is a seven company group composed as follows: Cie. Francaise des Petroles and an affiliate (32%), Shell (18%), Jersey Standard (17.6%), British Petroleum (10.4%), SN Repal (10%), Mobil (6%), and Beryl Algerie (6%).

SN REPAL and CIE DE RAFFINAGE EN AFRIQUE DU NORD, in a joint project, are constructing a $1.2 million, 4,000 b/d refinery at Hassi Messaoud, Algeria. Lummus Co.'s French subsidiary is construction contractor. Completion is expected this summer.

Angola

COMPANHIA DE PETROLEOS DE ANGOLA (PURFINA). Luanda, Angola.
Crude capacity: 3,000 b/d.

Egypt

ANGLO-EGYPTIAN OILFIELDS LTD. A.E.O. refinery, Suez, Egypt (U.A.R.). Plant manager, Mahmoud El Hifnawi.
Crude capacity: 55,000 b/d. Vacuum distillation, 7,700 b/d. Thermal cracking, 2,800 b/d. Thermal reforming, 2,800 b/d. Solutizer gasoline treating, 5,600 b/d. Acid treating (kerosine), 7,400 b/d.
Expansion by 20,000 b/d in crude capacity is scheduled for completion by 1963 including a 2,300 b/d catalytic reformer.

RAFFINERIE DE PETROLE DU GOVERNMENT. Suez, Egypt (UAR).
Crude capacity: 26,000 b/d. Thermal cracking, 3,600 b/d. Thermal reforming, 3,600 b/d. (This is a combination unit which can operate as a thermal cracker or a thermal reformer). Desulfurization, 4,800 b/d. Polymerization, 600 b/d. Lubes, 1,200 b/d.
A 3,000 b/d, $2.7 million catalytic reforming unit and a 2,700 b/d hydrodesulfurizer are planned for 1962-1963 completion. Expansion of crude capacity to 44,000 b/d is planned for completion by 1965. Technoexport, a Czechoslovakian company, will build the addition.

SOCIETE EGYPTIENNE pour le RAFFINAGE et le COMMERCE du PETROLE (SERCOP), Alexandria, Egypt. Plant manager, O. H. Hafez.
Crude capacity: 5,000 b/d. Catalytic reforming, 800 b/d. Perco desulfurization, 800 b/d. Petreco treating, 1,700 b/d.
Expansion of crude capacity to 25,000 b/d is under way, with completion expected by end-1961. USSR is furnishing equipment and technical assistance.

Ethiopia

THE RUSSIAN plan to build the first refinery in Ethiopia, at the port of Assab in Eritrea, has been cancelled. No further information has been reported.

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ENTE NAZIONALE IDROCARBURI, Italy's state oil agency, has signed an agreement with China's government to build a $20 million, 24,000 b/d refinery near Tema, with completion in mid-1963, and with eventual capacity of 40,000 b/d.

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A GROUP composed of Shell Co. of East Africa and BP (East Africa) Ltd. will build a 36,000 b/d refinery at Mombasa, Kenya, with completion expected in 1963, at an estimated $28 million.

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ESSO SIRTE, a Libya subsidiary of Standard Oil Co. (N. J.) will build a new 4,000 b/d refinery at the Mediterranean terminus, Marsa el Braika, of the pipeline to be built from Esso's Zelten field.

Morocco

SOCIETE CHERIFIENNE DES PETROLES. Petitjean, Morocco.
Crude capacity: 5,000 b/d. Catalytic cracking, 3,500 b/d.

SOC. MAROCAINE ITALIENNE DE RAFFINAGE (SAMIR) will complete in 1962 a new 25,000 b/d, $14 million refinery at Mohammadia, a port 19 miles from Casablanca, Morocco. SAMIR (50% ENI and 50% Moroccan capital), has let the contract to SNAM-Progetti, an ENI affiliate. Plant will include a 4,600 b/d Platformer and a 4,600 b/d Unifiner.

Mozambique

SOCIEDADE NACIONAL DE REFINACAO DE PETROLEOS (SONAREP), S.R.I. President, Manuel de Queiros Paraina; Edficio Santos Gil, 32, andar Salas 13 a 16, Lourenzo Marques, Mozambique.
SONAREP is building a new 12,000 b/sd refinery at Matola-Lourenzo Marques, Mozambique. Principal products will be gasoline, kerosine, jet fuel, gas oils, and fuel oils. Process units will include a 2,500 b/sd Platformer, 2,000 b/sd Unifiner (diesel fuel), and 1,500 b/sd UOP Merox treating unit. Procon (great Britain) Ltd. has the contract and completion is expected this summer.

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SHELL PETROLEUM REFINING CO. OF NIGERIA LTD., a new affiliate of Shell-BP Development Co., will build a $33 million, 20,000 b/d refinery at Port Harcourt, Nigeria, with completion 1963-64.

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South Africa

CALTEX has indicated plans for a $37 million, 30,000 b/d refinery in South Africa.

S. A. COAL, OIL AND GAS CORP. LTD. Sasolburg, South Africa. Managing director: P. E. Rousseau.
Principal products of this coal gasification plant include: gasoline, 2,300 b/d; diesel and furnace oil, 300 b/d; kerosine, heavy fuel oil, wax, LPG.

SOUTH AFRICAN PETROLEUM REFINERIES (PTY) LTD., 106 Victoria Embankment, Durban, So. Africa, general manager, W. J. Stok, has been formed by Royal Dutch/Shell and BP as equal partners, to complete by 1963, a new $70 million, 60,000 b/d refinery at Reunion Rocks, near Durban airport.

SOUTH AFRICAN TORBANITE MINING AND REFINING CO. LTD. Boksburg North, South Africa. Plant manager, G. G. Robertson.
Crude capacity: 3,500 n/d. Vacuum distillation, 2,000 b/d. Thermal cracking, 1,100 b/d. Mercaptan extraction, 2,000 b/d. Acid, caustic, doctor sweetening, totals 1,000 b/d.

STANDARD VACUUM REFINING CO. Durban, South Africa.
Crude capacity: 24,000 b/d. Thermal reforming, 2,000 b/d. Model IV Fluid catalytic cracking, 10,000 b/d. Catalytic reforming, 5,000 b/d. Hydrofining, 6,000 b/d. Polymerization, 300 b/d.
Expansion in crude capacity to 26,000 b/d is planned for 1962.

Sudan

AGIP MINERARIA (a subsidiary of the Italian State-owned ENI) has been negotiating with the Sudanese government on the construction of an $8.5 million refinery at Port Sudan.

A GROUP composed of Royal/Dutch Shell and British Petroleum has proposed to the government of Sudan a $16.8 million refinery of undisclosed size to be constructed at Port Sudan to meet local product requirements.

Tunisia

ENTE NATIONALE IDROCARBURI (ENI), the Italian State petroleum company, will build a $22 million, 20,000 b/d refinery at La Skhira, Tunisia.

Middle East

Aden

BP REFINERY (ADEN) LTD., P. O. Box 3003, Aden, Aden Colony. General manager, G. A. Malone.
Crude capacity: 120,000 b/sd. Catalytic reforming: Platformer, 12,000 b/sd. Hydrogen process: Autofining, 3,500 b/sd. SO_2 extraction, 9,000 b/sd. Solutizer, 24,000 b/sd. Copper chloride treating, 32,000 b/sd.
Under construction: $1.54 million expansion in crude capacity to 136,000 b/d. Completion date: end-1961.

Bahrain

BAHRAIN PETROLEUM CO. Bahrain Island, Bahrain. General manager, L. D. Josephson.
Crude capacity: 186,500 b/d. Vacuum distillation, 34,020 b/d. Thermal cracking, 8,010 b/d. Thermal reforming, 19,950 b/d. Fluid catalytic cracking, 27,300 b/d. Platforming, 10,450 b/d. Naphtha Unifining, 10,450 b/d. Polymerization, 2,050 b/d. SO_2 solvent extraction, 9,310 b/d. Acid treating, 15,130 b/d. Sweetening, 90,000 b/d. Asphalt, 1,990 b/d.

Iran

IRANIAN OIL REFINING CO. Abadan, Iran. General manager, J. P. Jochem.
Crude capacity: 415,000 b/d. Vacuum distillation, 74,000 b/d. Thermal reforming, 81,000 b/d. Fluid catalytic cracking, 35,000 b/d. Alkylation, 10,000 b/d. Butane isomerization, 15,000 b/d. SO_2 extraction, kerosine, 44,000 b/d. SO_2 extraction, aviation aromatics, 20,000 b/d. Furfural extraction, 1,000 b/d. M.E.K., 830 b/d. Treating (caustic, bleach, sulfuric acid, and plumbite units), total 532,000 b/d. Asphalt, 5,000 b/d.
Under construction: a $5 million, 20,000 b/d Unifiner-Platformer. Completion April, 1962. Contractor: Fluor Engineering & Construction Co., London.

IRANIAN OIL EXPLORATION AND PRODUCING CO. Field distillation units, Iran.
Crude capacity: 600 b/d.

IRANIAN OIL EXPLORATION AND PRODUCING CO. Masjid-I-Sulaiman, Iran.
Crude capacity: 18,000 b/d.

NATIONAL IRANIAN OIL CO. Kermanshah, Iran.
Crude capacity: 4,000 b/d.

Iraq

GOVERNMENT OIL REFINERIES ADMINISTRATION. Alwand, Iraq.
Crude capacity: 12,500 b/d.

GOVERNMENT OIL REFINERIES ADMINISTRATION. Baghdad (Dourah), Iraq.
Crude capacity: 48,000 b/d. Thermal cracking, 4,200 b/d. Thermal reforming, 2,900 b/d. Visbreaking, 9,600 b/d. Powerforming, 5,000 b/d. Kerosine treating, 5,000 b/d. Solvent refining (lubes), 500 b/d.
Expansion in crude capacity and installation of Powerformer and kerosine treater completed last year

at cost of $11 million. Foster Wheeler was principal engineering and construction contractor.

GOVERNMENT OIL REFINERIES ADMINISTRATION. Basrah (Muftiyah), Iraq.
Crude capacity: 4,280 b/d.
Plans have been reported for a new $56 million, 10,000 b/d refinery at Basrah to be completed within five years.

GOVERNMENT OIL REFINERIES ADMINISTRATION. Qaiyarah, Iraq.
Crude capacity: 5,600 b/d.
Expansion to 7,500 b/d crude capacity is planned.

IRAQ PETROLEUM CO. Haditha, Iraq.
Crude capacity: 6,500 b/d.

IRAQ PETROLEUM CO. Kirkuk, Iraq. General manager, A. J. Perks.
Crude capacity: 2,000 b/d (products used internally). Company also operates a part of its crude stabilization units as a crude topping facility, up to 25,500 b/d maximum capacity.

Israel

CONSOLIDATED REFINERIES LTD. Haifa, Israel. Managing director, A. Bartel.
Crude capacity: 75,000 b/d. Vacuum distillation, 4,100 b/d. Thermal cracking, 8,200 b/d. Thermal reforming, 7,500 b/d. Treating (Caustic, acid, plumbite), 8,000 b/d.

Jordan

JORDANIAN REFINERY WORKS CO. Amman, Jordan.
Crude capacity: 6,600 b/d. Catalytic cracking, 1,220 b/d. Catalytic reforming, 780 b/d.
A new $11.2 million refinery, completed this year.

Kuwait

KUWAIT OIL CO. LTD. Mina-al-Ahmadi, Kuwait.
Crude capacity: 171,000 b/d. Catalytic reforming, 3,800 b/d.

Lebanon

LEBANON REFINERY CO. LTD. Tripoli, Lebanon.
Crude capacity: 10,000 b/d. Catalytic reforming, 3,100 b/d.

MEDITERRANEAN REFINING CO. Sidon, Lebanon. General manager, J. B. Brown.
Crude capacity: 12,500 b/d. Platforming, 1,200 b/d. Treating, 1,600 b/d.

Neutral Zone

AMERICAN INDEPENDENT OIL CO. Mina Abdullah, Kuwait (Neutral Zone). General manager, G. Witherspoon.
Crude capacity: 30,000 b/d.

GETTY OIL CO. Mina Saud, Kuwait (Neutral Zone). Superintendent: J. C. McNair.
Crude capacity: 50,000 b/d.

Qatar

QATAR PETROLEUM CO. Umm Said, Qatar. Manager, G. Tod.
Crude capacity: 600 b/d.
Plans for expanding crude capacity to 2,400 b/d are scheduled for review in 1961.

Saudia Arabia

ARABIAN AMERICAN OIL CO. Ras Tanura, Saudi Arabia.
Crude capacity: 189,000 b/d. Thermal reforming, 25,000 b/d. Catalytic reforming, 14,000 b/d. Alkylation, 1,200 b/d. Hydrofining, 15,000 b/d. Polymerization, 1,000 b/d. Asphalt.

SAUDI ARABIAN REFINERY CO. (SARCO), established by Amir Sa'd ibn Sa'ud, son of the King, has been granted a concession to build a 20,000 b/d refinery at Jiddah, Saudi Arabia. Contractor is Ralph M. Parsons Co.

Syria

GOVERNMENT, Homs, Syria (U.A.R.)
Crude capacity: 20,000 b/d.
A 25,000 ton/yr lube oil plant is to be built under a technical and economic cooperation with Russia.

Turkey

ANADOLU TASFIYEHANESI A. S. Mersin, Turkey, plans a $43 million, 61,700 b/d refinery with expected completion in 1962. Plant will include: catalytic reforming, 7,200 b/d; kerosine desulfurization, 7,300 b/d; naphtha hydrodesulfurization, 16,000 b/d. Ownership is as follows: Mobil Refining, S. A., 37%; Cal-Tex, 34%; Raffinaderij Shell Mersin, N. V., 18% and BP, 11%. Foster Wheeler is the contractor.

ISTANBUL PETROL RAFINERISI A. S. will own and operate a 20,800 b/d, $26.65 million refinery at Izmit, to be built by Caltex and a government company, Turkiye Petroleri A. O. Facilities will include Fluid catalytic cracking, Platforming, Unifining, and distillate hydrotreating. M. W. Kellogg Co. is prime contractor.

MARMARA PETROL RAFINERI ISLERIA A.S., Istanbul, Turkey, has plans to build a 16,000 b/d refinery at Buyukcekmece, near Istanbul with completion next year.

TURKISH AMERICAN OIL CO., Istanbul, Turkey, has plans to build a 15,000 b/d refinery near Istanbul, to include visbreaking, 2,200 b/d; catalytic cracking, 4,400 b/d; and polymerization, 400 b/d.

TURKISH PETROLEUM CORP. Batman, Turkey. Plant manager, Hasan Goker.
Crude capacity: 7,000 b/sd. Vacuum distillation, 2,000 b/sd. Thermofor catalytic cracking, 3,000 b/sd. Doctor treating, 3,000 b/sd.
Expansion in crude capacity to 13,000 b/d is underway.

Asia and Far East

Australia

AMOCO AUSTRALIA PTY. LTD., a new subsidiary of Standard Oil Co. (Indiana), has established headquarters at Sydney, and plans a $24 million, 15,000 b/d refinery near Brisbane, Queensland, Australia, for completion no later than Dec. 31, 1966. Managing director is F. McKinley Blough.

AMPOL PETROLEUM LTD. Plans a $33 million refinery of undisclosed size at Port Alma, on the Queensland, Australia, coast. Government has granted Ampol an option on 400 acres of land.

AUSTRALIAN OIL REFINING PTY. LTD. Kurnell, New South Wales, Australia.
Crude capacity: 46,000 b/d. Model IV Fluid catalytic cracking, 24,500 b/d. Polymerization, 2,700 b/d. Propane decarbonizer, 9,500 b/d.
Expansion in crude capacity to 90,000 b/d is planned for 1961 or 1962, plus catalytic cracking, 18,000 b/d and alkylation, 3,400 b/d, at cost of $29 million.

BITUMEN AND OIL REFINERIES (AUSTRALIA) LTD. (BORAL). Brisbane, Queensland, Australia.
Crude capacity: 2,000 b/d.

BITUMEN AND OIL REFINERIES (AUSTRALIA) LTD. (BORAL). P.O. Box 1, Metraville, N.S.W. Australia. Plant manager, B. A. Raper.
Crude capacity: 17,000 b/d. Vacuum distillation, 10,000 b/sd. Catalytic reforming: Platformer, 5,500 b/sd. Naphthat Unifining, 5,400 b/sd. Diesel oil Unifining, 4,500 b/sd. Solvent fractionation, 800 b/sd. Two asphalt converters of 500 bbl holding capacity.
BORAL expects to complete a new $5 million 4,500 b/d. Fluid catalytic cracking unit at Mattraville by the end of 1961.

B.P. REFINERY AUSTRALIA LTD. Kwinana, Western Australia.
Crude capacity: 70,000 b/d. Vacuum distillation, 24,000 b/d. Catalytic cracking, 12,500 b/d. Platforming, 16,000 b/d. Desulfurization, 5,600 b/d.
Construction: A new $16 million, 2,000 b/sd lubricating oil plant, with completion in 1963. Major units will include vacuum distillation, furfural extraction, MEK/toluene dewaxing, and "Ferrofining," a hydrofinishing process. Foster Wheeler Ltd., in association with Constructors John Brown (Australia) Ltd., is the contractor.

SHELL REFINING (AUSTRALIA) PTY. LTD. Clyde refinery, P. O. Box 26, Granville, N.S.W., Australia. Plant manager, T. A. Dent.
Crude capacity: 20,000 b/d. Vacuum distillation, 1,300 b/d. Catalytic reforming, Platformer, 6,700 b/d. Lube treating and solvents manufacture.
A $50 million expansion program at Clyde includes a $38 million, 11,750 b/d catalytic cracking unit, to be completed about 1963.

SHELL REFINING (AUSTRALIA) PTY. LTD. Geelong refinery, Corio, Victoria, Australia. Plant manager, R. D. Crook.
Crude capacity: 46,000 b/d. Vacuum distillation, 30,400 b/d. Fluid catalytic cracking, 15,000 b/d. Platforming, 6,700 b/d. Shell hydrodesulfurization, 11,000 b/d. Mixed feed polymerization, 1,800 b/d. Solutizer and Diethanolamine treating. Asphalt, 100 metric ton/day. Sulfuric acid manufacture, 100 metric ton/day.
Planned: $13.5 million, 19 million Imp. gal-yr lube oil plant (about 1,000 b/d).

STANDARD-VACUUM REFINING CO. (AUSTRALIA) PTY. LTD. Altona, Victoria, Australia. Refinery manager, R. J. Anderson.
Crude capacity: 43,000 b/d. Airlift Thermofor catalytic cracking, 23,500 b/d. Platforming, 8,000 b/sd. Catalytic hydrodesulfurization, 10,000 b/sd. Sulfuric acid alkylation, 1,700 b/sd. Asphalt oxidation, 2,000 b/sd.

VACUUM OIL CO. PTY LTD. Expects to complete in January, 1963, a $36 million, 37,800 b/d refinery on a 594-acre site at Port Noarlunga, 14 miles south of Adelaide, South Australia. Major units will include atmospheric and vacuum distillation, hydrodesulfurization, catalytic reforming, and sulfur recovery. Plan is to operate on Persian Gulf crude oil. Principal contractor is M. W. Kellogg.

British Borneo

SARAWAK SHELL OILFIELDS LTD. Lutong, Miri, Sarawak, British Borneo. Plant manager, A. H. Garside.
Crude capacity: 50,000 b/cd. Principal products, gasoline, naphtha, gas oil, marine diesel fuel, fuel oil.

Burma

BURMAH OIL CO. LTD. Chauk, Burma.
Crude capacity: 5,800 b/d.

BURMAH OIL CO. LTD. Syriam (Rangoon) Burma.
Crude capacity: 5,300 b/d. Thermal cracking, 1,700 b/d.
Planned: expansion in crude capacity to about 11,000 b/d, by early 1963.

NATHSINGH OIL CO. LTD. Yenangyaung, Burma. Managing director, V. Nathsingh.
Crude capacity: 500 b/d.

Ceylon

A MULTI-COMPANY GROUP (BP and Shell 60%, Stanvac 20%, Caltex 20%) is planning a 22,000 b/d refinery at Colombo, Ceylon, with expected completion in 1963. Cost is estimated at $30 million.

India

ASSAM OIL CO. LTD. Digboi, India. Manager: Sri A. Subramani.
Crude capacity: 10,000 b/d. Thermal cracking, 1,900 b/d. Lubes, 100 b/d.

BURMAH-SHELL REFINERIES LTD. Bombay, India. Manager, D. W. Wookey.
Crude capacity: 53,000 b/d. Catalytic cracking, 12,000 b/d. Platforming, 6,700 b/d. Lube oils, gasoline and kerosine treating. Asphalt production.

CALTEX (INDIA) LTD. Visakhapatam, India.
Crude capacity: 16,000 b/d. Model IV catalytic cracking, 7,500 b/d. Polymerization, 800 b/d.

INDIAN REFINERIES LTD. (owned 2/3 by Assam Oil Ltd. and 1/3 by the Indian Government) is constructing a 50,000 b/d, $88 million refinery at Barauni, Bihar, India, with completion scheduled for 1963. It is planned to include a lube oil unit and a 20,000 ton/yr LPG facility.

INDIAN REFINERIES LTD. will complete in 1961 a 20,000 b/d $38 million refinery at Gauhati, Assam, India with engineering and construction by Rumanian government interests.

INDIAN REFINERIES LTD. has started preliminary work on a 10,000 to 20,000 b/d refinery in Gujarat State, which would process Cambay region crude oil, with Indian engineers trained in Romania handling the work. Proposal anticipates technical help and equipment also from Soviet sources.

INDIAN REFINERIES LTD. is considering a new 10,000 ton/yr lube oil plant on India's west coast, possibly in place of the unit proposed for Barauni refinery. This plant would be in addition to that proposed by Stanvac (in which Stanvac would take in the government as 50% partner).

Yugoslavia

RAFINERIJA NAFTE BOSANSKI BROD (Yugoslav government) Bosanski Brod, Yugoslavia.
Crude capacity: 20,000 b/d. Thermal cracking, 2,400 b/d. Lubes, 400 b/d.

RAFINERIJA NAFTE "BORIS KIDRIC" (Yugoslav government) Rijeka, Yugoslavia.
Crude capacity: 8,600 b/d. Solvent refining, 800 b/d.

RAFINERIJA NAFTE SISAK (Yugoslav government) Sisak, Yugoslavia. Plant manager, Karo Krajner.
Crude capacity: 10,300 b/d. Vacuum distillation, 3,600 b/d. Catalytic cracking, 2,000 b/d. Treating.
Planned: expansion of crude capacity to 20,000 b/d, plus catalytic reforming.

YUGOSLAV GOVERNMENT plans a refinery at Zadar, on the Dalmatian coast, with an initial capacity of 8,000 b/d. to be increased later by stages to 24,000 b/d.

YUGOSLAV GOVERNMENT has indicated plans for a 23,000 b/d refinery at Pancevo, near Belgrade, for completion about 1965.

Africa

Algeria

SOCIETE DE LA RAFFINERIE D'ALGER, Maison Carree (near Algiers), Algeria, plans a new 50,000 b/d, $40 million refinery, with completion in 1963. This is a seven company group composed as follows: Cie. Francaise des Petroles and an affiliate (32%), Shell (18%), Jersey Standard (17.6%), British Petroleum (10.4%), SN Repal (10%), Mobil (6%), and Beryl Algerie (6%).

SN REPAL and CIE DE RAFFINAGE EN AFRIQUE DU NORD, in a joint project, are constructing a $1.2 million, 4,000 b/d refinery at Hassi Messaoud, Algeria. Lummus Co.'s French subsidiary is construction contractor. Completion is expected this summer.

Angola

COMPANHIA DE PETROLEOS DE ANGOLA (PURFINA). Luanda, Angola.
Crude capacity: 3,000 b/d.

Egypt

ANGLO-EGYPTIAN OILFIELDS LTD. A.E.O. refinery, Suez, Egypt (U.A.R.). Plant manager, Mahmoud El Hifnawi.
Crude capacity: 55,000 b/d. Vacuum distillation, 7,700 b/d. Thermal cracking, 2,800 b/d. Thermal reforming, 2,800 b/d. Solutizer gasoline treating, 5,600 b/d. Acid treating (kerosine), 7,400 b/d.
Expansion by 20,000 b/d in crude capacity is scheduled for completion by 1963 including a 2,300 b/d catalytic reformer.

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Crude capacity: 26,000 b/d. Thermal cracking, 3,600 b/d. Thermal reforming, 3,600 b/d. (This is a combination unit which can operate as a thermal cracker or a thermal reformer). Desulfurization, 4,800 b/d. Polymerization, 600 b/d. Lubes, 1,200 b/d.
A 3,000 b/d, $2.7 million catalytic reforming unit and a 2,700 b/d hydrodesulfurizer are planned for 1962-1963 completion. Expansion of crude capacity to 44,000 b/d is planned for completion by 1965. Technoexport, a Czechoslovakian company, will build the addition.

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Expansion of crude capacity to 25,000 b/d is under way, with completion expected by end-1961. USSR is furnishing equipment and technical assistance.

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SOUTH AFRICAN TORBANITE MINING AND REFINING CO. LTD. Boksburg North, South Africa. Plant manager, G. G. Robertson.
Crude capacity: 3,500 o/d. Vacuum distillation, 2,000 b/d. Thermal cracking, 1,100 b/d. Mercaptan extraction, 2,000 b/d. Acid, caustic, doctor sweetening, totals 1,000 b/d.

STANDARD VACUUM REFINING CO. Durban, South Africa.
Crude capacity: 24,000 b/d. Thermal reforming, 2,000 b/d. Model IV Fluid catalytic cracking, 10,000 b/d. Catalytic reforming, 5,000 b/d. Hydrofining, 6,000 b/d. Polymerization, 300 b/d.
Expansion in crude capacity to 26,000 b/d is planned for 1962.

Sudan

AGIP MINERARIA (a subsidiary of the Italian State-owned ENI) has been negotiating with the Sudanese government on the construction of an $8.5 million refinery at Port Sudan.

A GROUP composed of Royal/Dutch Shell and British Petroleum has proposed to the government of Sudan a $16.8 million refinery of undisclosed size to be constructed at Port Sudan to meet local product requirements.

Tunisia

ENTE NATIONALE IDROCARBURI (ENI), the Italian State petroleum company, will build a $22 million, 20,000 b/d refinery at La Skhira, Tunisia.

Middle East

Aden

BP REFINERY (ADEN) LTD., P. O. Box 3003, Aden, Aden Colony. General manager, G. A. Malone.
Crude capacity: 120,000 b/sd. Catalytic reforming: Platformer, 12,000 b/sd. Hydrogen process: Autofining, 3,500 b/sd. SO_2 extraction, 9,000 b/sd. Solutizer, 24,000 b/sd. Copper chloride treating, 32,000 b/sd.
Under construction: $1.54 million expansion in crude capacity to 136,000 b/d. Completion date: end-1961.

Bahrain

BAHRAIN PETROLEUM CO. Bahrain Island, Bahrain. General manager, L. D. Josephson.
Crude capacity: 186,500 b/d. Vacuum distillation, 34,020 b/d. Thermal cracking, 8,010 b/d. Thermal reforming, 19,950 b/d. Fluid catalytic cracking, 27,300 b/d. Platforming, 10,450 b/d. Naphtha Unifining, 10,450 b/d. Polymerization, 2,050 b/d. SO_2 solvent extraction, 9,310 b/d. Acid treating, 15,130 b/d. Sweetening, 90,000 b/d. Asphalt, 1,990 b/d.

Iran

IRANIAN OIL REFINING CO. Abadan, Iran. General manager, J. P. Jochem.
Crude capacity: 415,000 b/d. Vacuum distillation, 74,000 b/d. Thermal reforming, 81,000 b/d. Fluid catalytic cracking, 35,000 b/d. Alkylation, 10,000 b/d. Butane isomerization, 15,000 b/d. SO_2 extraction, kerosine, 44,000 b/d. SO_2 extraction, aviation aromatics, 20,000 b/d. Furfural extraction, 1,000 b/d. M.E.K., 830 b/d. Treating (caustic, bleach, sulfuric acid, and plumbite units), total 532,000 b/d. Asphalt, 5,000 b/d.
Under construction: a $5 million, 20,000 b/d Unifiner-Platformer. Completion April, 1962. Contractor: Fluor Engineering & Construction Co., London.

IRANIAN OIL EXPLORATION AND PRODUCING CO. Field distillation units, Iran.
Crude capacity: 600 b/d.

IRANIAN OIL EXPLORATION AND PRODUCING CO. Masjid-I-Sulaiman, Iran.
Crude capacity: 18,000 b/d.

NATIONAL IRANIAN OIL CO. Kermanshah, Iran.
Crude capacity: 4,000 b/d.

Iraq

GOVERNMENT OIL REFINERIES ADMINISTRATION. Alwand, Iraq.
Crude capacity: 12,500 b/d.

GOVERNMENT OIL REFINERIES ADMINISTRATION. Baghdad (Dourah), Iraq.
Crude capacity: 48,000 b/d. Thermal cracking, 4,200 b/d. Thermal reforming, 2,900 b/d. Visbreaking, 9,600 b/d. Powerforming, 5,000 b/d. Kerosine treating, 5,000 b/d. Solvent refining (lubes), 500 b/d.
Expansion in crude capacity and installation of Powerformer and kerosine treater completed last year.

at cost of $11 million. Foster Wheeler was principal engineering and construction contractor.

GOVERNMENT OIL REFINERIES ADMINISTRATION. Basrah (Muftiyah), Iraq.
Crude capacity: 4,280 b/d.
Plans have been reported for a new $56 million, 40,000 b/d refinery at Basrah to be completed within five years.

GOVERNMENT OIL REFINERIES ADMINISTRATION. Qaiyarah, Iraq.
Crude capacity: 5,600 b/d.
Expansion to 7,500 b/d crude capacity is planned.

IRAQ PETROLEUM CO. Haditha, Iraq.
Crude capacity: 6,500 b/d.

IRAQ PETROLEUM CO. Kirkuk, Iraq. General manager, A. J. Perks.
Crude capacity: 2,000 b/d (products used internally). Company also operates a part of its crude stabilization units as a crude topping facility, up to 25,500 b/d maximum capacity.

Israel

CONSOLIDATED REFINERIES LTD. Haifa, Israel. Managing director, A. Bartel.
Crude capacity: 75,000 b/d. Vacuum distillation, 4,100 b/d. Thermal cracking, 8,200 b/d. Thermal reforming, 7,500 b/d. Treating (Caustic, acid, plumbite), 8,000 b/d.

Jordan

JORDANIAN REFINERY WORKS CO. Amman, Jordan.
Crude capacity: 6,600 b/d. Catalytic cracking, 1,220 b/d. Catalytic reforming, 780 b/d.
A new $11.2 million refinery, completed this year.

Kuwait

KUWAIT OIL CO. LTD. Mina-al-Ahmadi, Kuwait.
Crude capacity: 171,000 b/d. Catalytic reforming, 3,800 b/d.

Lebanon

LEBANON REFINERY CO. LTD. Tripoli, Lebanon.
Crude capacity: 10,000 b/d. Catalytic reforming, 3,100 b/d.

MEDITERRANEAN REFINING CO. Sidon, Lebanon. General manager, J. B. Brown.
Crude capacity: 12,500 b/d. Platforming, 1,200 b/d. Treating, 1,600 b/d.

Neutral Zone

AMERICAN INDEPENDENT OIL CO. Mina Abdullah, Kuwait (Neutral Zone). General manager, G. Witherspoon.
Crude capacity: 30,000 b/d.

GETTY OIL CO. Mina Saud, Kuwait (Neutral Zone). Superintendent: J. C. McNair.
Crude capacity: 50,000 b/d.

Qatar

QATAR PETROLEUM CO. Umm Saud, Qatar. Manager, G. Tod.
Crude capacity: 600 b/d.
Plans for expanding crude capacity to 2,400 b/d are scheduled for review in 1961.

Saudia Arabia

ARABIAN AMERICAN OIL CO. Ras Tanura, Saudi Arabia.
Crude capacity: 189,000 b/d. Thermal reforming, 25,000 b/d. Catalytic reforming, 14,000 b/d. Alkylation, 1,200 b/d. Hydrofining, 15,000 b/d. Polymerization, 1,000 b/d. Asphalt.

SAUDI ARABIAN REFINERY CO. (SARCO), established by Amir Sa'd ibn Sa'ud, son of the King, has been granted a concession to build a 20,000 b/d refinery at Jiddah, Saudi Arabia. Contractor is Ralph M. Parsons Co.

Syria

GOVERNMENT, Homs, Syria (U.A.R.).
Crude capacity: 20,000 b/d.
A 25,000 ton/yr lube oil plant is to be built under a technical and economic cooperation with Russia.

Turkey

ANADOLU TASFIYEHANESI A. S. Mersin, Turkey, plans a $43 million, 61,700 b/d refinery with expected completion in 1962. Plant will include: catalytic reforming, 7,200 b/d; kerosine desulfurization, 7,300 b/d; naphtha hydrodesulfurization, 16,000 b/d. Ownership is as follows: Mobil Refining, S. A., 37%; Cal-Tex, 34%; Raffinaderij Shell Mersin, N. V., 18% and BP, 11%. Foster Wheeler is the contractor.

ISTANBUL PETROL RAFINERISI A. S. will own and operate a 20,800 b/d, $26.65 million refinery at Izmit, to be built by Caltex and a government company, Turkiye Petroleri A. O. Facilities will include Fluid catalytic cracking, Platforming, Unifining, and distillate hydrotreating. M. W. Kellogg Co. is prime contractor.

MARMARA PETROL RAFINERI ISLERIA A.S., Istanbul, Turkey, has plans to build a 16,000 b/d refinery at Buyukcekmece, near Istanbul with completion next year.

TURKISH AMERICAN OIL CO., Istanbul, Turkey, has plans to build a 15,000 b/d refinery near Istanbul, to include visbreaking, 2,200 b/d; catalytic cracking, 4,400 b/d; and polymerization, 400 b/d.

TURKISH PETROLEUM CORP. Batman, Turkey. Plant manager, Hasan Goker.
Crude capacity: 7,000 b/sd. Vacuum distillation, 2,000 b/sd. Thermofor catalytic cracking, 3,000 b/sd. Doctor treating, 3,000 b/sd.
Expansion in crude capacity to 13,000 b/d is underway.

Asia and Far East

Australia

AMOCO AUSTRALIA PTY. LTD., a new subsidiary of Standard Oil Co. (Indiana), has established headquarters at Sydney, and plans a $24 million, 15,000 b/d refinery near Brisbane, Queensland, Australia, for completion no later than Dec. 31, 1966. Managing director is F. McKinley Blough.

AMPOL PETROLEUM LTD. Plans a $33 million refinery of undisclosed size at Port Alma, on the Queensland, Australia, coast. Government has granted Ampol an option on 400 acres of land.

AUSTRALIAN OIL REFINING PTY. LTD. Kurnell, New South Wales, Australia.
Crude capacity: 46,000 b/d. Model IV Fluid catalytic cracking, 24,500 b/d. Polymerization, 2,700 b/d. Propane decarbonizer, 9,500 b/d.
Expansion in crude capacity to 90,000 b/d is planned for 1961 or 1962, plus catalytic cracking, 18,000 b/d and alkylation, 3,400 b/d, at cost of $29 million.

BITUMEN AND OIL REFINERIES (AUSTRALIA) LTD. (BORAL), Brisbane, Queensland, Australia.
Crude capacity: 2,000 b/d.

BITUMEN AND OIL REFINERIES (AUSTRALIA) LTD. (BORAL), P.O. Box 1, Metraville, N.S.W. Australia. Plant manager, B. A. Raper.
Crude capacity: 17,000 b/d. Vacuum distillation, 10,000 b/sd. Catalytic reforming: Platformer, 3,500 b/sd. Naphthat Unifining, 3,400 b/sd. Diesel oil Unifining, 4,500 b/sd. Solvent fractionation, 800 b/sd. Two asphalt converters of 500 bbl holding capacity.
BORAL expects to complete a new $5 million 4,500 b/d. Fluid catalytic cracking unit at Matraville by the end of 1961.

B.P. REFINERY AUSTRALIA LTD. Kwinana, Western Australia.
Crude capacity: 70,000 b/d. Vacuum distillation, 24,000 b/d. Catalytic cracking, 12,500 b/d. Platforming, 16,000 b/d. Desulfurization, 5,600 b/d.
Construction: A new $16 million, 2,000 b/sd lubricating oil plant, with completion in 1963. Major units will include vacuum distillation, furfural extraction, MEK/toluene dewaxing, and "Ferrofining," a hydrofinishing process. Foster Wheeler Ltd., in association with Constructors John Brown (Australia) Ltd., is the contractor.

SHELL REFINING (AUSTRALIA) PTY. LTD. Clyde refinery, P. O. Box 26, Granville, N.S.W., Australia. Plant manager, T. A. Dent.
Crude capacity: 20,000 b/d. Vacuum distillation, 1,300 b/d. Catalytic reforming, Platformer, 6,700 b/d. Lube treating and solvents manufacture.
A $50 million expansion program at Clyde includes a $38 million, 11,750 b/d catalytic cracking unit, to be completed about 1963.

SHELL REFINING (AUSTRALIA) PTY. LTD. Geelong refinery, Corio, Victoria, Australia. Plant manager, R. D. Crook.
Crude capacity: 46,000 b/d. Vacuum distillation, 30,400 b/d. Fluid catalytic cracking, 15,000 b/d. Platforming, 6,700 b/d. Shell hydrodesulfurization, 11,000 b/d. Mixed feed polymerization, 1,800 b/d. Solutizer and Diethanolamine treating. Asphalt, 100 metric ton/day. Sulfuric acid manufacture, 100 metric ton/day.
Planned: $13.5 million, 19 million Imp. gal-yr lube oil plant (about 1,000 b/d).

STANDARD-VACUUM REFINING CO. (AUSTRALIA) PTY. LTD. Altona, Victoria, Australia. Refinery manager, R. J. Anderson.
Crude capacity: 43,000 b/d. Airlift Thermofor catalytic cracking, 23,500 b/d. Platforming, 8,000 b/sd. Catalytic hydrodesulfurization, 10,000 b/sd. Sulfuric acid alkylation, 1,700 b/sd. Asphalt oxidation, 2,000 b/sd.

VACUUM OIL CO. PTY LTD. Expects to complete in January, 1963, a $36 million, 37,800 b/d refinery on a 594-acre site at Port Noarlunga, 14 miles south of Adelaide, South Australia. Major units will include atmospheric and vacuum distillation, hydrodesulfurization, catalytic reforming, and sulfur recovery. Plan is to operate on Persian Gulf crude oil. Principal contractor is M. W. Kellogg.

British Borneo

SARAWAK SHELL OILFIELDS LTD. Lutong, Miri, Sarawak, British Borneo. Plant manager, A. H. Garside.
Crude capacity: 50,000 b/cd. Principal products, gasoline, naphtha, gas oil, marine diesel fuel, fuel oil.

Burma

BURMAH OIL CO. LTD. Chauk, Burma.
Crude capacity: 5,800 b/d.

BURMAH OIL CO. LTD. Syriam (Rangoon) Burma.
Crude capacity: 5,300 b/d. Thermal cracking, 1,700 b/d.
Planned: expansion in crude capacity to about 11,000 b/d, by early 1963.

NATHSINGH OIL CO. LTD. Yenangyaung, Burma. Managing director, V. Nathsingh.
Crude capacity: 500 b/d.

Ceylon

A MULTI-COMPANY GROUP (BP and Shell 60%, Stanvac 20%, Caltex 20%) is planning a 22,000 b/d refinery at Colombo, Ceylon, with expected completion in 1963. Cost is estimated at $30 million.

India

ASSAM OIL CO. LTD. Digboi, India. Manager: Sri A. Subramani.
Crude capacity: 10,000 b/d. Thermal cracking, 1,900 b/d. Lubes, 100 b/d.

BURMAH-SHELL REFINERIES LTD. Bombay, India. Manager, D. W. Wookey.
Crude capacity: 53,000 b/d. Catalytic cracking, 12,000 b/d. Platforming, 6,700 b/d. Lube oils, gasoline and kerosine treating. Asphalt production.

CALTEX (INDIA) LTD. Visakhapatam, India.
Crude capacity: 16,000 b/d. Model IV catalytic cracking, 7,500 b/d. Polymerization, 800 b/d.

INDIAN REFINERIES LTD. (owned 2/3 by Assam Oil Ltd. and 1/3 by the Indian Government) is constructing a 50,000 b/d, $88 million refinery at Barauni, Bihar, India, with completion scheduled for 1963. It is planned to include a lube oil unit and a 20,000 ton/yr LPG facility.

INDIAN REFINERIES LTD. will complete in 1961 a 20,000 b/d $38 million refinery at Gauhati, Assam, India with engineering and construction by Rumanian government interests.

INDIAN REFINERIES LTD. has started preliminary work on a 10,000 to 20,000 b/d refinery in Gujarat State, which would process Cambay region crude oil, with Indian engineers trained in Romania handling the work. Proposal anticipates technical help and equipment also from Soviet sources.

INDIAN REFINERIES LTD. is considering a new 10,000 ton/yr lube oil plant on India's west coast, possibly in place of the unit proposed for Barauni refinery. This plant would be in addition to that proposed by Stanvac (in which Stanvac would take in the government as 50% partner).

STANDARD-VACUUM REFINING CO. OF INDIA LTD. Bombay, India. Refinery manager, C. W. Couch.

Crude capacity: 38,000 b/d. Vacuum distillation, 2,600 b/d. Thermal reforming, 3,800 b/d. Model IV Fluid catalytic cracking, 8,800 b/d. (total feed). Polymerization, 250 b/d. SO_2 extraction, 4,200 b/d. Copper chloride and Hypochloride treating, Asphalt, 1,750 b/d.

Stanvac has proposed construction of a $9 million, 2,000 b/d lube oil unit, on 50-50 basis with Indian government or another Indian investor.

Indonesia

N. V. DE BATAAFSCHE PETROLEUM MIJ. (SHELL). Balik Papan. Kalimantan, Indonesia. Plant manager, R. F. Clay.

Crude capacity: 75,000 b/d. Vacuum distillation, 12,000 b/d. Solutizer treating, 3,600 b/d. Wax production, 50,000 ton/year.

N. V. DE BATAAFSCHE PETROLEUM MIJ. (SHELL). Pladju, South Sumatra, Indonesia.

Crude capacity: 114,000 b/d. Thermal cracking, 10,000 b/d. Thermal reforming, 15,000 b/d. Alkylation, 5,300 b/d. Polymerization, 400 b/d.

N. V. DE BATAAFSCHE PETROLEUM MIJ. (SHELL). Tjepu, Central Java, Indonesia.

Crude capacity: 4,600 b/d.

N. V. DE BATAAFSCHE PETROLEUM MIJ. (SHELL). Wonokromo, East Java, Indonesia.

Crude capacity: 3,200 b/d.

INDONESIAN GOVERNMENT. Pangkalan, Brandan, North Sumatra, Indonesia.

Crude capacity: 2,000 b/d.

STANDARD-VACUUM PETROLEUM MIJ. Sungei Gerong, South Sumatra, Indonesia.

Crude capacity: 82,500 b/d. Thermal cracking, 34,000 b/d. Catalytic cracking, 10,000 b/d. Alkylation, 800 b/d. Polymerization, 1,200 b/d.

Japan

ARABIAN OIL CO. plans a 45,000 b/d refinery at Shizuoka, Japan for completion in Jan., 1963.

DAIKYO OIL CO. Yokkaichi, East Coast of Honshu, Japan. Mgr.: Toru Ata.

Crude capacity: 55,000 b/d. Vacuum distillation, 14,000 b/d. Thermal reforming, 200 b/d. Catalytic cracking, 3,500 b/d. Catalytic reforming, 3,000 b/d. Lubes, 1,800 b/d.

GENERAL BUSSAN. Kawasaki, Tokyo Bay, Japan.

Crude capacity of this new refinery, planned for completion in 1962, will be 38,000 b/d, and it will include a 3,800 b/d catalytic reforming unit, and 5,700 b/d Merox unit.

IDEMITSU KOSAN LTD. Shingu-Cho, Tokuyama City, Yamaguchi Pref., Japan. Plant manager, Masaru Yamato.

Crude capacity: 100,000 b/sd. Vacuum distillation, 20,000 b/sd. UOP catalytic cracking, 7,000 b/d. Platforming, 8,000 b/sd. Unisol, 5,000 b/sd. Unifining, 9,000 b/sd. Sulfur recovery. Asphalt.

Under construction: a UOP Merox unit, 10,000 b/d is planned.

IDEMITSU KOSAN LTD. plans a new 80,000 b/d refinery in 1962, at Kawasaki, on Tokyo Bay, Japan, including a 15,000 b/d catalytic cracking unit, and a 5,000 b/d catalytic reforming unit.

KOA OIL CO. LTD. 1768, Wagi-Mura, Kuga-Gun, Yamaguchi-Ken, Japan, Plant manager, Hiroshi Kinbara.

Crude capacity: 33,300 b/sd. Vacuum distillation, 12,000 b/sd. Fluid catalytic cracking, 5,500 b/sd. Platforming, 3,300 b/sd. Doctor sweetening, 4,800 b/sd. Acid Treating, 1,600 b/sd. UOP coking, 5,500 b/d (60,000 ton/yr of coke).

Planned: crude expansion to 40,000, in 1961.

KYUSHU OIL CO. plans a $44 million 40,000 b/d, refinery on a 840-acre site at Tsurusaki, Kyushu, Japan, with completion in the fall of 1962.

MARUZEN OIL CO. LTD. Matsuyama refinery, Matsuyama, Ehime Pref., Japan. Plant manager, Tetsuo Oiwa.

Crude capacity: 35,000 b/d. Visbreaking, 4,500 b/d. Platforming, 3,000 b/d. Treating processes, total 6,000 b/d. Fed preparation unit, 4,000 b/d. Udex extraction, 1,500 b/d.

Planned: Expansion of crude capacity to 46,000 b/d by Jan. 1962. Unifiner, 4,000 b/d.

MARUZEN OIL CO. LTD. Osaka refinery, 2-Chome, Hukamichi, Taisho-ku, Osaka, Japan. Plant manager, C. Sakamoto.

The Osaka refinery is a grease plant.

Maruzen has plans to eventually build a 50,000 b/d refinery at Osaka, with completion in 1965.

MARUZEN OIL CO. LTD. (Kudamatsu refinery), Wakayama, Japan. Plant manager, Shokuro Takehara.

Crude capacity: 37,500 b/d. Vacuum distillation, 11,260 b/d. UOP Fluid catalytic cracking, 5,000 b/d. Duo-Sol extraction, 1,000 b/d. MEK dewaxing, 750 b/d. Treating processes, total 12,000 b/d.

Planned: Unifiner-Platformer, 6,000 b/d; Unifiner, 4,500 b/d.

MARUZEN OIL CO. is scheduled to complete a 100,000 b/d refinery at Goi (Chiba) on Tokyo Bay, Japan in 1965, with part of the plant to be finished and on stream earlier.

MITSUBISHI OIL CO. LTD. Kawasaki refinery, Kawasaki City, Japan. Manager, Michiya Miyoshi.

Crude capacity: 53,940 b/sd. Vacuum distillation, 3,800 b/sd. Catalytic cracking, 3,500 b/d. Platforming, 5,500 b/sd. Unifining, 12,500 b/sd. Furfural refining, 430 b/sd. M.E.K. toluol dewaxing, 600 b/sd. Treating processes, total, 7,950 b/sd. Udex extraction, 750 b/sd. Crude desalting, 25,000 b/sd. Asphalt oxidation, 300 b/sd.

MITSUBISHI OIL CO. will complete in September of this year a 40,000 b/d, $38.5 million refinery, including harbor facilities, at Mizushima, Japan. Downstream processes include vacuum distillation, 20,000 b/d; distillate Unifining, 7,000 b/d; Platforming-Unifining, 3,600 b/d; Merox, 2,000 b/d. Products will be: gasoline, 5,100 b/d; jet fuel, 425 b/d; Kerosene, 1,275 b/d; fuel oil, 23,000 b/d; LPgas, 500 ton/month.

A second construction phase, to be completed October, 1962, at a cost of $19.5 million will add the following: catalytic cracking, sulfur recovery, hydrogen production, and expansion of Unifining.

Major contractor is Chiyoda Chemical Engineering & Construction Co. Ltd.

NEW ASIA OIL CO. Hakodate, Hokkaido, Japan. Mgr.: Yoshinosuke Motoyama.

Crude capacity: 12,000 b/d. Catalytic reforming, 1,500 b/d.

NEW ASIA OIL CO. Yokohama, Japan. Mgr.: Tokukichi Murai.

Crude capacity: 43,000 b/d. Vacuum distillation, 1,000 b/d. Platforming-Unifining, 1,600 b/d. Gasoline treating, 3,000 b/d. Kerosine treating, 1,500 b/d. Lubes, 500 b/d.

Planned for 1961 completion: Unifiner, 3,000 b/d; Platformer-Unifiner, 5,000 b/d; Merox, 4,000 b/d.

Crude expansion to 70,000 b/d in 1963.

NIPPON MINING CO. Funakawa, west coast of Honshu, Japan. Mgr.: Hideo Takano.

Crude capacity: 19,350 b/d. Vacuum distillation, 2,000 b/d. Catalytic reforming, 1,000 b/d. Lubes, 400 b/d.

NIPPON MINING CO. will complete by mid-1961 its new 30,000 b/d refinery at Mizushima, Japan, including a 6,000 b/d Houdriformer and an 8,000 b/d hydrodesulfurization unit.

Planned: Unifining, 2,000 b/d and Unisol, 2,500 b/d. Crude capacity is to be expanded to 100,000 b/d late in the 1960's.

NIPPON OIL CO. Akita, Japan. Manager: Yasushige Eno.

Crude capacity: 4,000 b/d. Vacuum distillation, 2,140 b/d. Thermal cracking, 1,000 b/d. Lube oils, 200 b/d.

NIPPON OIL CO. Kashiwazaki, Japan. Manager: Kazuhiko Ozaki.

Crude capacity: 1,800 b/d. Lube oils, 200 b/d.

NIPPON OIL CO. Niigata, Japan. Manager: Ryoichi Kumagaya.

Crude capacity: 7,500 b/d. Vacuum distillation, 2,000 b/d. Catalytic reforming, 1,600 b/d. Lube oils, 900 b/d.

Planned: crude expansion to 10,000 b/d in 1962.

NIPPON OIL CO. has requested government approval to build a 200,000 b/d refinery at Nishinomiya, Japan, plus a petrochemical plant and harbor facilities. Target for completion, 1970.

NIPPON PARAFFIN CO. Tokuyama, Inland Sea, Japan. Mgr.: Yoshio Hiramatsu.

Crude capacity: 1,510 b/d.

NIPPON PETROLEUM REFINING CO. LTD. 766 Miyanosuhama, Higashitoyoi, Kudamatsu City, Japan. Plant manager, Ryukichi Miyata.

Crude capacity: 20,000 b/sd. Vacuum distillation, 4,500 b/sd. Platforming, 1,650 b/sd. Furfural extraction, 550 b/sd. Benzol ketone dewaxing, 1,000 b/sd. Treating processes, total 4,800 b/sd. Clay contact, 1,100 b/sd. Asphalt, 570 b/sd. Wax, 120 b/sd.

NIPPON PETROLEUM REFINING CO. LTD. 165 Horomoecho, Muroran City, Japan. Plant manager, Shigeo Iida.

Crude capacity: 7,500 b/sd. Vacuum distillation, 1,500 b/d. Treating, 2,375 b/sd.

Planned: crude expansion to 10,000 b/d.

NIPPON PETROLEUM REFINING CO. LTD. Yokohama City, Japan. Mgr.: Tamiji Kuwabara.

Crude capacity: 48,400 b/sd. Vacuum distillation, 10,000 b/sd. Fluid Model IV catalytic cracking, 5,600 b/sd. Unifining-Platforming, 3,300 b/sd. Propane deasphalting, 3,500 b/sd. Furfural extraction, 1,080 b/sd. Benzol ketone dewaxing, 3,150 b/sd. Treating processes, 10,860 b/sd. Clay contacting, 1,300 b/sd. Asphalt, 200 b/sd. Wax, 110 b/sd.

Planned: for 1961 completion, 7,500 b/d UOP Fluid Catalytic cracking unit and crude expansion to 76,400 b/d.

NIPPON PETROLEUM REFINING plans a 75,000 b/d refinery at Negishi by 1963.

REKISEI MINERAL OIL CO. Niigata, west coast of Honshu, Japan.

Crude capacity: 1,100 b/d. Lubes, 300 b/d.

SHOWA OIL CO. Hirasawa, west coast of Honshu, Japan. Mgr.: Akira Kita.

Crude capacity: 3,000 b/d. Vacuum distillation, 1,000 b/d. Lubes, 400 b/d.

SHOWA OIL CO. Kawasaki, Tokyo Bay, Japan. Mgr.: Senkichi Niitsu.

Crude capacity: 26,000 b/d. Vacuum distillation, 3,000 b/d. Platformer, 1,500 b/d. Conventional lube manufacture, 1,000 b/d. Solvent refining, 300 b/d.

Planned: For 1961 completion, expansion of crude capacity to 46,000 b/d and 6,000 b/d Unifiner-Platformer. Planned, no completion date, Unifiner and Merox units.

SHOWA OIL CO. Niigata, west coast of Honshu, Japan. Mgr.: Saburo Sugiura.

Crude capacity: 11,000 b/d. Vacuum distillation, 1,600 b/d. Lubes 400 b/d.

SHOWA YOKKAICHI OIL CO. Yokkaichi, east coast of Honshu, Japan. Mgr.: Shiro Inoue.

Crude capacity: 53,000 b/d. Vacuum distillation, 23,500 b/d. Catalytic cracking, 12,000 b/d.

Planned: crude expansion to 60,000 b/d this year, and to 100,000 b/d in 1963.

TAIYO OIL CO. Kameoka, Shikoku, Japan.

Crude capacity: 22,000 b/d. Vacuum distillation, 10,000 b/d. Lubes, 400 b/d.

Planned: crude expansion to 25,000 b/d this year.

TOA NENRYO KOGYO. Shimizu, east coast of Honshu, Japan. Mgr.: Shunji Omiga.

Crude capacity: 43,500 b/d. Vacuum distillation, 3,800 b/d. Catalytic reforming, 4,600 b/d. Desulfurization, 4,200 b/d. Lubes, 600 b/d.

Under construction: expansion of downstream process units, at cost of $12.5 million.

TOA NENRYO KOGYO. Wakayama, Inland Sea, Japan. Mgr.: Yasuhiro Tajima.

Crude capacity: 57,000 b/d. Vacuum distillation, 15,500 b/d. Thermal cracking, 3,200 b/d. Catalytic cracking, 10,200 b/d. Catalytic reforming, 4,700 b/d. Alkylation, 1,500 b/d. Conventional lube manufacture, 900 b/d, solvent refining, 700 b/d.

TOA NENRYO KOGYO plans a 50,000 b/d refinery at Kawasaki in 1962.

TOA OIL CO. Kawasaki, Tokyo Bay, Japan. Mgr.: Jintaro Sugiura.

Crude capacity: 20,000 b/d.

Korea (South)

SOUTH KOREA government has started an entirely new program for construction of a 15,000 b/d refinery, program replacing original plans for Korean Petroleum Co. project which was inaugurated under Syngman Rhee. No further information has been reported.

MARUZEN OIL CO. of Japan is studying a project to build a 20,000 to 30,000 b/d refinery at Urusan in South Korea.

Malaya

SHELL CO. OF THE FEDERATION OF MALAYA LTD. plans a $20 million 20,000 b/d refinery in Malaya; site as yet is not decided.

STANDARD VACUUM OIL CO. plans a new 20,000 b/d refinery at Port Dickson, Malaya. Total investment of $30 million will include a synthetic fertilizer plant. Completion, mid-1963.

New Zealand

NEW ZEALAND REFINING CO. LTD. will own and operate a new 50,000 b/d refinery to be built at Marsden Point near Whangarei in North Auckland, New Zealand, by a consortium of five companies (Mobil, Shell, B.P., Caltex, and Todd), with completion early in 1964. Processing units will include crude still, catalytic reforming, gasoline treating, asphalt, and possibly gas oil hydrodesulfurization. Products will be gasoline, gas oil, diesel and fuel oil, and asphalt. The first chairman of the firm is L. G. Hucks, managing director of BP (New Zealand) Ltd.

Pakistan

ATTOCK OIL CO. LTD. Rawalpindi, Pakistan.
Crude capacity: 5,000 b/d.

PAKISTAN REFINERY LTD. (Stanvac 18%, Shell 36%, Caltex, 6%, private capital 40%) has awarded Kellogg International Corp. the contract for its new 32,000 b/d $35 million refinery at Korangi, six miles east of Karachi, Pakistan, with completion anticipated late in 1962. Downstream processing will include catalytic reforming and hydrotreating.

Philippines

CALTEX (PHILIPPINES). Batangas, Philippine Islands.
Crude capacity: 23,000 b/d. Model IV Fluid catalytic cracking, 5,400 b/d. Polymerization, 1,500 b/d.

FILOIL REFINERY CORP. Union Cement Bldg., Bonifacio Drive, Manila, Philippine Islands, plans a new 10,000 b/d refinery, with expected completion in 1962 at Rosario, Cavite. Products would include gasoline, kerosine, bunker fuel, diesel fuel, and diesel oil. President of Filoil is Ramon V. del Rosario.

SHELL REFINING (PHILIPPINES) INC. is building a $20 milion, 25,000 b/d refinery at Batangas, 76 miles south of Manila, with completion scheduled at end of 1962. Total capital of 43 million pesos ($21.5 million) involved in project will comprise about 25% local investment and 70% British. Bechtel Corp. has the contract.

STANDARD-VACUUM REFINING CORP. (PHILLIPPINES), Manila, Philippine Islands. General manager, R. E. Pulver.
Crude capacity: 24,000 b/d. Vacuum distillation, 9,200 b/d. Thermofor catalytic cracking, 6,500 b/d (fresh feed). Catalytic reforming, 3,400 b/d. Hydrodesulfurization, 8,750 b/d str. run naphtha and 5,500 b/d gas oil. Polymerization, 1,800 b/d. Treating, 2,400 b/d. Caustic washing, 2,500 b/d gasolines and 3,000 b/d kerosine.

Singapore

MARUZEN OIL CO., in a joint venture with Tokyo Menka Kaisha Ltd. expected to complete a 20,000 b/d, $22-million refinery at Singapore in November, 1961.

SHELL OIL CO. OF SINGAPORE LTD. is constructing a $13 million, 20,000 b/d refinery on Pulau Bukom, 4 miles south of Singapore Island. Completion expected late 1961.

Taiwan

CHINESE PETROLEUM CORP. Kaohsiung, Taiwan. Vice President, J. S. Hu.
Crude capacity: 35,000 b/d. Vacuum distillation, 12,000 b/d. Thermal cracking, 4,500 b/d. Thermofor catalytic cracking, 10,000 b/d. Atlantic catalytic reforming, 3,100 b/d. Unifining 5,500 b/d. Sulfuric acid alkylation 900 b/d. Sulfur, 15 ton/day. Sulfuric acid, 15 ton/day.

Thailand

THAI GOVERNMENT. Farng, Thailand.
Crude capacity: 1,000 b/d.

THAI GOVERNMENT, after several proposals made by private capital to build plants, has decided to go ahead with its own project for a 5,000 b/d, $19 million refinery at Mae Sud, near Bangkok, Thailand. Hydrocarbon Research Inc. has contracted with Commentry-Oissel Cie. of France to supply engineering services. Houdry Process Corp. will supply a 2,000 b/d catalytic cracking unit.

Vietnam

Standard Vacuum Oil Co. and Shell Vietnam have made applications to the Vietnam government to build a 22,000 b/d refinery, at an estimated $15 million.

USSR and Bloc

Albania

CERRIK REFINERY (Albania Government). Cerrik, Albania.
Crude capacity: 2,741 b/d.

"J. V. STALIN MINERAL OIL COMBINAT" (Albanian Government). Stalin (Kucove) Albania.
Crude capacity: 5,482 b/d.

Bulgaria

BULGARIAN GOVERNMENT is building a 40,000 b/d refinery and will build a 10,000 ton/yr polyethylene plant, at Burgas, on Black Sea coast, with completion of first stage by mid-1963.

RUSE REFINERIES (Bulgarian Government). Ruse, Bulgaria.
Crude capacity: 2,390 b/d.
Under construction: a vacuum distillation unit. (Asphalt, 800 b/d total).

China

A RUSSIAN designed 20,000 b/d refinery at Lanchow, China has an increase in capacity planned to 100,000 b/d by the end of 1962, assuming completion of a 400-mile crude line from Yumen fields to the northwest.

Czechoslovakia

"J. V. STALIN FUEL WORKS" (Czechoslovak Government). Zaluzi, Czechoslovakia.
This is a synthetic fuels (from coal) plant with a crude distillation unit and downstream processing. Output of fuels from coal will remain constant in coming years (9 tons of coal to make 1 ton fuel), but output of fuels from petroleum is to be raised. Products include gasoline, jet fuel, and petrochemicals.

KOLIN REFINERY (Czechoslovak Government). Kolin, Czechoslovakia.
Crude capacity, not disclosed, is to be increased by 50% by 1965. A dewaxing unit is to be built.

"SLOVNAFT" REFINERY (Czechoslovak Government). Podunajske Biskupice, near Bratislava, Czechoslovakia.
Crude capacity is being expanded to 93,000 b/d, with completion for 1965.

Germany (East)

SCHWEDT REFINERY (East German Government), Schwedt, East Germany, is a new plant now under construction. Crude capacity is to be 40,000 b/d by 1963, then expanded to 100,000 b/d by 1965 and 160,000 b/d by 1970.

VEB MINERALOELWERKE LUETZKENDORF (East German Government). Luetzkendorf, East Germany.
Crude capacity not disclosed. Products include gasoline, kerosine, diesel fuel, lube oils.

"WALTER ULBRICHT" LEUNA I WORKS (East German Government). Leuna, East Germany, a synthetic fuels plant, will construct a 2,000 b/d cracking unit before the Schwedt refinery goes onstream.

Hungary

CSEPEL REFINERY (Hungarian Government). Csepel (Budapest), Hungary.
Crude capacity not disclosed. Products: lube oil, solvents.

THE HUNGARIAN GOVERNMENT is building a new 60,000 b/d refinery at Szazholmobatta, 15 miles south of Budapest, on the Danube River, to operate on Russian oil.

SZONEY REFINERY (Hungarian Government). Szony, Hungary.
Crude capacity: 5,000 b/d.
Under construction: new 21,000 b/d crude distillation unit, for completion late 1961, being designed and constructed by Soc. Francaise d'Engineering in cooperation with Soc. Controle et Application, of Paris, France. Also, thermal cracking (8,361 b/d), supplied by USSR, and completion late in 1961. Planned by 1965, new crude still and a reformer.

Korea (North)

NORTH KOREAN government plans the country's first refinery, of 40,000 b/d capacity, with technical assistance by Russia. USSR will also supply crude.

Poland

CZECHOWICE REFINERY (Polish Government). Czechowice, Poland.
Crude capacity: 1,626 b/d. Greases.
Planned: expansion of crude capacity to 10,164 b/d, by 1965.

GLINIK MARIAMPOLSKI REFINERY (Polish Government). Glink Mariampolski, Poland.
Crude capacity: 3,049 b/d. Grease manufacture.

JASLO REFINERY (Polish Government). Jaslo, Poland.
Crude capacity: 3,385 b/d. Grease manufacture.

JEDLICZE REFINERY (Polish Government). Jedlicze, Poland.
Crude capacity: 3,049 b/d.

POLISH GOVERNMENT has started construction of a new refinery at Plock, Poland. First phase, to be completed in 1964, will provide crude capacity of 40,000 b/d, plus thermal and catalytic cracking. The second construction phase, to be completed 1967, will add 81,000 b/d of crude capacity, plus lube oil and wax processing.
A petrochemical plant will also be constructed at Plock. Total investment represented for the entire project when complete (122,000 b/d refinery plus the petrochemical units) is estimated at $2.5 billion.

TRZEBINIA REFINERY (Polish Government). Trzebinia, Poland.
Crude capacity: 6,302 b/d.

Romania

GOVERNMENT REFINERY NO. 1. Ploesti.
Crude distillation, thermal cracking, thermal reforming, lube oil processing.

GOVERNMENT REFINERY NO. 3. Teleajen.
Crude distillation, lube oil units, solvent refining, clay contacting, dewaxing.

GOVERNMENT REFINERY NO. 4. Cimpina.
Crude distillation, thermal cracking, thermal reforming, vacuum distillation.

GOVERNMENT REFINERY NO. 7. Brazi.
Crude distillation and cracking.

GOVERNMENT REFINERY NO. 8. Darmanesti.
Crude distillation (three units), thermal cracking (two units).

GOVERNMENT REFINERY NO. 9. Brasov.
No crude distillation. Lube oil plant only.

GOVERNMENT REFINERY NO. 10. Onesti.
Crude distillation, thermal and catalytic cracking, gas processing.
Total crude capacity of all Romanian refineries is 248,500 b/d. Total thermal cracking, 77,835 b/d, and catalytic cracking, 5,100 b/d.

U.S.S.R.

No official data are available concerning the number of refineries in the Soviet Union, their capacities or all of the locations. At least 60 locations are known, and are listed below.
Total crude capacity for the USSR is estimated at 2.39 million b/d in 1960. Government plans will raise this to about 5.4 million b/d by 1965.
Refinery locations (individual republic is in **boldface** and cities in lightface):
Azerbaydzhan: Baku.
Byleorussia: Polotsk.
Georgia: Batumi, Tbilisi.
Kazakh: Guryev.
Latvia: Riga.
R.S.F.S.R.: Bugurslan, Chelyabinsk, Chernikovsk, Engels, Gorkiy, Groznyy, Irkutsk, Ishimbay, Kazan, Khabarovsk, Komsomolsk, Konstantinovskiy, Krasnodar, Krasnokamsk, Krasnoyarsk, Kurgan, Kuybyshev, Leningrad, Melnokovo, Nikolayevsk, Novo-Novo Ishimbay, Novo Kuybyshevsk, Novo Yaroslavl, Molotov (Perm), Moscow, Odessa, Okha, Orsk, Ryazan, Saratov, Stalingrad, Sterlitamak, Syzran, Tuapee, Ufa, Ukhta, Vladivostok, Yaroslavl.
Tadzhik: Kanabadam.
Turkmen: Krasnovodsk, Nebit-Dag (Neftdag).
Ukraine: Berdyansk, Borislav, Dolina, Drogobych, Kherson, Kolomyya, Lvov, Makhachkala, Nadvornaya, Nikolayev, Osipenko, Stansilav.
Uzbek: Andizhan, Fergana, Santo Dimion, Vannovskiy.

The world's petrochemical plants

North America

Canada

B-A SHAWINIGAN LTD. Montreal, Que., Canada. Plant manager, R. B. Walker.
Raw material: cumene.
Products: phenol, more than 35 million lb/yr; acetone, more than 21 million lb/yr; isopropanol, methyl styrene, bis-phenol.

BORDER CHEMICALS CO. Winnipeg, Manitoba.
Raw material: sour natural gas.
Products: sulfuric acid, 75 ton/day.
New $1 million plant, on stream late in 1960.

BRITISH AMERICAN OIL CO. LTD., plans 15 million gal/yr cyclohexane facilities at Clarkson, Ontario, with completion fall of 1962.

BRITISH AMERICAN OIL CO. LTD., Montreal, Que., Canada.
Raw material: propylene and benzene.
Product: cumene, 600 b/d.
Under construction: $2.5 million Udex unit for benzene, toluene, xylenes, for completion in July, 1961. Benzene will go to B. A.-Shawinigan.

BRITISH AMERICAN OIL CO. LTD. Nevis field, Alberta, Canada.
Raw material: natural gas.
Product: sulfur, 64 ton/day.

BRITISH AMERICAN OIL CO. LTD. Rimbey, Alberta, Canada.
Raw material: natural gas from Dick Lake and Homeglen-Rimbey fields.
Product: sulfur, 233 ton/day.
New $12 million plant, completed in November, 1960. Contractor was Poole-Pritchard.

BRITISH AMERICAN OIL CO. LTD. Pincher Creek, Alberta, Canada.
Raw material: natural gas.
Product: sulfur, 690 long ton/day.

BROCKVILLE CHEMICALS, LTD. (subsidiary of Sogemines Ltd.), was scheduled to complete this summer a $17 million plant at Brockville (Maitland), Ont., Canada, to produce ammonia, nitrogen chemicals, and hydrogen. Company has awarded a contract to P. G. Engineering Co. for construction of a 15 mcf/d plant, using Texaco partial oxidation process and operating on natural gas from western Canada.

CABOT CARBON CO. OF CANADA LTD. Sarnia, Ont., Canada. Plant manager, W. F. Hendricks.
Raw materials: petroleum fractions.
Products: oil-type furnace black, more than 55 million lb/yr.

CALIFORNIA STANDARD CO., North Nevis, Alberta, Canada.
Raw material: natural gas from Homeglen-Rimbey field.
Product: Sulfur, 104 ton/day.

CANADIAN CHEMICAL CO. LTD., Edmonton, Alta., Canada. Plant manager, J. C. Langford.
Raw materials: Butane and propane.
Products: pentaerythritol, methanol, propanol, other alcohols, mono- and di-propylene, glycol, propyl acetate, acetic acid, acetone, aldehydes, ketones, cellulose acetates.
A $4 million expansion, to be completed early in 1961, will increase productive capacity by 40%.

CANADIAN INDUSTRIES, LTD. Beloeil, Que., Canada, is scheduled to complete a $500,000 plant this year for production of pentaerythritol tetranitrate, the first such plant in Canada.

CANADIAN INDUSTRIES LTD. Edmonton, Alta., Canada. Works manager, S. T. Jones.
Raw material: natural gas.
Product: polyethylene, 40 million lb/yr.

CANADIAN INDUSTRIES LTD., Millhaven, near Kingston, Ont., Canada.
Raw material: fuel oil, ethylene glycol, terephthalic acid.
Products: anhydrous ammonia, 200 ton/day; synthetic polyester fiber and flake, "Terylene."

CANADIAN OIL COS. LTD. Corunna, near Sarnia, Ont., Canada.
Raw material: refinery streams.
Product: benzene, toluene, xylenes, aromatic solvents, paraffinic solvents, hydrogen, methane, ethane, ethylene, propane-propylene, butane-butylene.
Under construction: $750,000 Hydeal unit (Ashland Oil developed, UOP-licensed) to double benzene production to 7 million gal/yr, with completion this summer.

CANADIAN OIL COS. LTD. Innisfail, Alberta, Canada.
Raw materials: natural gas from Innisfail field.
Product: Sulfur, 80 ton/day.
New plant, completed late in 1960.

CARBIDE CHEMICALS CO., Montreal East, Que., Canada.
Raw material: refinery gases.
Products: ethylene; ethylene oxide; ethylene glycols, 50 million lb/yr; polyethylene glycols; glycol ethers; ethanolamines; and polyethylene, 65 million lb/yr.
Combined capacity for ethylene oxide, polyglycols, glycol ethers and ethanol amines was to be doubled this year.

COLUMBIAN CARBON (CANADA) LTD. Toronto, Ont., expected to complete this year a $5 million carbon black plant with an initial capacity of 40 million lb/yr, at Hamilton, Ontario.

CONSOLIDATED MINING & SMELTING CO. OF CANADA LTD. Turner Siding, and Calgary, Alta, Canada. Superintendent at Calgary, R. S. Woodford.
Raw material: natural gas.
Products: ammonia, 325 ton/day; ammonium nitrate, 200 ton/day; sulfur, 20 ton/day.
A $5 million, 36,000 ton/yr urea plant was completed in Calgary last year.

CYANAMID OF CANADA LTD. Welland (Hamilton Bay), Ont., Canada, has completed this year a $5 million project to convert to natural gas from coal as a raw material for manufacture of ammonia, ammonium nitrate and urea. Rated capacities are: ammonia, 52,500 ton/yr; urea, 66,000 ton/yr; nitric acid, 68,400 ton/yr.

DOW CHEMICAL CO. OF CANADA LTD. is constructing a new plant at Fort Saskatchewan, Alta. The first units will produce ethanolamines, glycols and pentachlorophenol; the pentachlorophenol unit went into operation late in 1960, the others will be completed in the summer 1961. Robert T. Richardson is works manager. Brown & Root built the pentachlorophenol unit.

DOW CHEMICAL CO. OF CANADA LTD. Sarnia, Ont., Canada.
Raw material: petroleum hydrocarbon streams, benzene, and butadiene.
Products: carbon tetrachloride, diethanolamine, diethylene glycol, dichloroethyl ether, ethanolamine, ethyl chloride, ethylene oxide, ethylene glycol, perchloroethylene, styrene, polystyrene, styrene-butadiene latex, trichlorothylene, triethanolamine, triethylene glycol, polyethylene, ammonia and vinyl chloride.
Planned: 12 million lb/yr polypropylene unit, near end of 1962.

DOW CHEMICAL CO. OF CANADA LTD. will complete a 24 million lb/yr phenol plant at Vancouver, British Columbia, Canada this summer. Ernest N. Banks is operations manager. Bechtel Corp. has the contract.

DU PONT CO. OF CANADA LTD. Sarnia, Ont., Canada, has started up a new low pressure polyethylene plant.

DU PONT CO. OF CANADA LTD., Maitland, Ont., Canada.
Raw materials: cyclohexane, ammonia, carbon tetrachloride, chloroform, polyacrylonitrile, hydrofluoric acid.
Products: adipic acid, hexamethylene diamine, chlorofluoromethanes, acrylic fiber, hydrogen peroxide.

ETHYL CORP. OF CANADA LTD. Sarnia, Ont., Canada.
Raw materials: ethane and ethylene.
Product: Tetraethyl lead anti-knock compounds, ethyl chloride, ethylene dichloride.

HOME OIL CO. LTD., Carstairs, Alberta, Canada, expects to complete this year an expansion project of its natural gas plant, including installation of 55 ton/day sulfur capacity. Fluor Corp. of Canada has the contract.

HUDSON'S BAY OIL & GAS CO. LTD., CANADIAN FINA, AND PAN AMERICAN PETROLEUM will complete early in 1962 a natural gas plant in the Windfall field of Alberta, Canada, with productive capacity for 580 ton/day of sulfur.

IMPERIAL OIL LTD. Sarnia, Ont., Canada.
Raw material: natural gas.
Product: sulfur 12 ton/day.

IMPERIAL OIL LTD. Cannia, Ont., Canada.
Raw materials: petroleum gas and liquid streams.
Products: tripropylene, tetrapropylene, detergent alkylate (30 million lb/yr of alkyl aryl benzene); alkylate bottoms, aliphatic solvents, ethylene, propylene, butadiene (18,000 ton/yr), butylenes, aromatic distillates and tars, petroleum polymers.
Planned: $5 million, 30 million gal/yr benzene unit, with completion this fall. Canadian Betchtel Ltd. has the contract.

IRVING REFINING LTD., St. John, New Brunswick, Canada.
Raw material: refinery gases.
Product: sulfur, 30 long ton/day.

JEFFERSON LAKE PETROCHEMICALS OF CANADA LTD., Coleman, Alberta, Canada, is planning a gas processing plant for gas from Savanna Creek field, which will produce about 500 long ton/day. Investment cost is approximately $3 million, $20 million (entire plant.)

JEFFERSON LAKE PETROCHEMICALS OF CANADA LTD., Fort St. John, British Columbia, Canada.
Raw material: natural gas.
Product: sulfur, 325 ton/day.

LAURENTIDE CHEMICALS & SULFUR LTD., Montreal East, Que., Canada.
Raw materials: natural gas and refinery gases.
Product: sulfur, 100 ton/day.

LUBRIZOL OF CANADA LTD., Niagara Falls, Ont., Canada.
Raw material: petroleum fractions.
Products: lube oil additives.

MONSANTO CANADA LTD. Montreal, Que., Canada.
Raw material: styrene.
Product: polystyrene, 20 million lb/yr, maleic anhydride, 6 million lb/yr.

NEVIS OPERATORS COMMITTEE, Nevis, Alberta, will complete this year a 45 mmcf/d gas processing plant, including sulfur recovery at 150 ton/day. Investment cost is approximately $3 million. Mobil Oil will be operator and Fluor is the contractor.

NEW SURPASS PETROCHEMICALS LTD., Scarborough, Ont., Canada.
Raw materials: petroleum fractions, polyalkylated benzene, oxidates.
Products: petroleum sulfonates and derivatives, oil

additives, corrosion inhibitors, rust preventives, greases.

NORTHWEST NITRO-CHEMICALS LTD. Medicine Hat, Alta, Canada.
Raw material: natural gas.
Products: ammonia, nitrogen, and phosphate fertilizers.

PETROGAS PROCESSING LTD. has been organized in Calgary, Alberta, Canada, to carry out the $13 million natural gas plant to serve the East Calgary field, producing 863 to 900 ton/day of sulfur, with completion expected early in 1962. Prime contracts are held by Ralph M. Parsons Co. of Canada Ltd., Pipe Line Technologists (Alberta) Ltd. and Bannister Construction. A large group of companies are involved, including Jefferson Lake Petrochemicals, the firm that planned the project originally, as the plant operator.

POLYMER CORP. LTD. Sarnia, Ont., Canada. Vice President, L. D. Dougan.
Raw materials: refinery streams.
Products: styrene, butadiene, butadiene-styrene and butyl and nitrile type rubbers, ethylene, isobutylene; total rubber production about 135,000 long ton/yr).
Planned: 20,000 ton/yr polybutadiene unit, under licenses from Ziegler and Goodrich-Gulf Chemicals, Inc., with completion in 1962. Construction: a $1.5 million butadiene extraction unit, for completion this fall; Fluor Corp. has the contract.

REICHHOLD CHEMICALS (CANADA) LTD. Port Moody, British Columbia, Canada, plans facilities for phenol and formaldehyde production.

REICHHOLD CHEMICALS (CANADA) LTD. Ste. Therese, Que., Canada, is building a new phthalic anhydride unit with a capacity of 7 million lb/yr.

ROYALITE OIL CO LTD. Turner Valley, Alta, Canada.
Raw material: natural gas.
Product: sulfur, 35 ton/day.

ST. MAURICE CHEMICALS, Division of Shawinigan Chemicals Ltd. Varennes, Que., Canada.
Raw material: methanol.
Products: formaldehyde, pentaerythritol.

SHELL OIL CO. OF CANADA LTD. Jumping Pound, Alta., Canada.
Raw material: natural gas.
Product: sulfur, 80 long ton/day.

SHELL OIL CO. OF CANADA LTD. Montreal, Que., Canada. Superintendent, R. Wiens.
Raw materials: propylene, butylenes, benzene.
Products: isopropanol, acetone, sec-butanol, methyl ethyl ketone, epoxy resins (3 million lb/yr), detergent alkylate. Total capacity all products, approximately 40 million lb/yr.

SHELL OIL CO. OF CANADA LTD. has given Canadian Bechtel Ltd. contract for a $20 million, 200 mmcf/d natural gas plant in the Waterton field of Alberta, with sulfur production of 1,000 ton/day, and completion expected late this year.

SHERRITT GORDON MINES LTD. Fort Saskatchewan, Alta., Canada.
Raw material: natural gas.
Products: ammonia, 180 ton/day; ammonium sulfate, 100,000 ton/yr.

STEELMAN GAS LTD., Steelman, Saskatchewan, Canada.
Raw material: natural gas.
Product: sulfur, 6 long ton/day.

SUN OIL CO. LTD. Sarnia, Ont., Canada.
Raw materials: refinery streams.
Product: butylenes.

TEXACO CANADA LTD., Montreal East, Que., Canada.
Raw material: refinery gases.
Product: ethylene.

TEXACO CANADA LTD., Edmonton, Alta., Canada.
Raw materials: propane-butane.
Products: feedstocks for petrochemicals.

TEXACO CANADA LTD. expects to complete this year a $2 million benzene and toluene unit at Port Credit, Ontario (Regent Refining refinery), to produce 1,500 b/d of benzene, comprising a catalytic reformer and a Udex extraction unit. Provision is being made for future production of xylenes and ethyl benzene.

TEXAS GULF SULPHUR CO. INC. Okotoks, near Calgary, Alberta, Canada.
Raw material: natural gas.
Product: sulfur, 370 ton/day.

WESTERN LEASEHOLDS LTD. will complete this year a $6 million, 70 mmcf/d natural gas plant, with sulfur production of 106 ton/day, in the Wildcat Hills field, Alberta.

Mexico

CARA MOLINA-FONT is operating a plant recently completed by Oronite Division, California Chemical Co., at Mexico City, Mexico, with productive capacity of 1 million gal/yr of lube oil additives.

PETROLEOS MEXICANOS, Atzcapotzalco, near Mexico City.
Raw materials: refinery streams.
Products: sulfur, 15,000 ton/yr; dodecylbenzene, 15,400 ton/yr.
Under construction: ethylene, 14,000 ton/yr; polyethylene, 12,000 ton/yr. Probable completion mid-1962.

PETROLEOS MEXICANOS, Ciudad Madero, near Tampico, Mexico. Superintendent: Ing. Francisco L. Corcuera.
Products: sulfur, 15,150 ton/yr; tetramer; 11,000 ton/yr; alkylbenzene, 11,000 ton/yr.
Under construction: dodecylbenzene, 15,425 ton/yr; butadiene, 22,000 ton/yr; styrene, 15,000 ton/yr; copolymer rubber, 20,000 ton/yr—all Arthur G. McKee Co. contract. Ethyl chloride, 15,000 ton/yr; and ethylene dichloride, 22,000 ton/yr—Lummus Co. contract.

PETROLEOS MEXICANOS, Minatitlan, has under construction: benzene, 112,500 ton/yr; toluene, 90,000 ton/yr; meta and para xylene, 41,000 ton/yr; ethyl benzene, 17,500 ton/yr; ammonia, 73,000 ton/yr; urea (99,000 ton/yr here and Salamanca); ammonium nitrate (75,000 ton/yr here and Monclova); ethylene (110 million lb/yr here and Mexico City).

PETROLEOS MEXICANOS, Poza Rica, Mexico.
Raw material: sour natural gas.
Product: sulfur, 51,000 ton/yr.

PETROLEOS MEXICANOS, Salamanca.
Product: ammonium sulfate, 1,825 ton/yr.
Under construction: anhydrous ammonia, 73,000 ton/yr (Lummus Co. has contract); and carbon black, 24,000 ton/yr.

PETROLEOS MEXICANOS plans construction between 1961 and 1965 at Coatzacoalcos, Veracruz state, of the following facilities: ethylene, 60 million lb/yr; ethylene chloride, 15,000 ton/yr; ethylene dichloride, 22,000 ton/yr; ethylene dibromide, 4,400 ton/yr; tetra ethyl lead, 24,000 ton/yr; metallic sodium, 3,600 ton/yr; vinyl chloride, 10,000 ton/yr; acetaldehyde, 22,000 ton /yr.

SINTESIS ORGANICAS, Mexico City, Mexico.
Raw material: napthalene.
Product: phthalic anhydride.

Central and South America

Argentina

CABOT CARBON CORP. will build a $4 million, 13,000 ton/yr carbon black plant at Campana, Argentina, north of Buenos Aires.

CARBOMETAL, Mendoza, Argentina, is planning the following facilities: polyvinyl chloride, 4,500 ton/yr; acetylene, 200 ton/yr; plastics, 7,500 ton/yr.

CIA. NACIONAL PARA LA INDUSTRIA QUIMICA (ATANOR), Rio Tercero, Cordoba Prov., Argentina, plans to shift from charcoal to natural gas as raw material for its methanol production, and to increase capacity to 12,000 ton/yr.

DELTA OIL CO. has requested 60 acres of land from the Army Ordnance Works at a location near San Nicolas, Buenos Aires Province, Argentina, for erecting a plant to manufacture petroleum and tar derivatives.

DIADEMA ARGENTINA S.A. DE PETROLEO (Shell) reportedly is giving consideration to entering manufacture in Argentina of a line of petrochemicals, although no announcement have been made.

DUPERIAL S.A., Argentine subsidiary of Imperial Chemical Industries Ltd. will build a $16 million, 10,000 ton/yr ethylene plant at San Lorenzo, Argentina, and reportedly plans phthalic anhydride facilities by 1963.

ELECTROCHLOR, owned jointly by Duperial (Imperial Chemical Industries) and Cellulosa Argentina (Italian group Pomiglio), will enlarge its ammonia plant in Juan Ortiz near San Lorenzo, Santa Fe, Argentina, to 20,000 ton/yr, and will shift to natural gas as its raw material.

ESSO S.A.P.A. is reportedly giving strong consideration to entering manufacture in Argentina of a line of petrochemicals, though no announcements have been made.

HYDROCARBON ARGENTINA S.A. will complete in 1963 a $15 million refinery and petrochemical plant at San Lorenzo, Argentina (see also refinery listing), whose products will include 8,000 to 11,000 b/d high octane gasoline and 700 b/d benzene. Company is owned 50-50 by Hydrocarbon Research Inc. of New York and Minera Alumine of Buenos Aires.

INDUSTRIAS PLASTICAS ARGENTINAS KOPPERS S.A. La Plata, near Buenos Aires, Argentina.
Raw materials: refinery gases.
A $24 million plant is planned for completion in 1961, ethylene; polyethylene, 15 million lb/yr; styrene, 33 million lb/yr.

INDUSTRIAL QUIMICAS S.A. INDUSTRIAL Y COMMERCIAL (DURANOR), formed recently by Hooker Chemical Corp. and Cia. Nacional para la Industria Quimica (ATANOR), will complete a 25 metric ton/day phenol plant at Rio Tercero, Cordoba, Argentina, in about two years.

MONSANTO ARGENTINA S.A. Buenos Aires, Argentina is building a phthalic anhydride plant at Zarate, near Buenos Aires.

PETROQUIMICA ARGENTINA S.A., a new company formed by five U. S. firms, plans a $75 million petrochemical complex at San Lorenzo, on the Parana River, about 250 miles northwest of Buenos Aires, with initial stages completed near the end of 1962 and final completion in 1964. The companies are Cities Service Co., Continental Oil Co., Fish International Corp., United States Rubber Co. and Witco Chemical Co.
Products planned include: butadiene, 32,000 ton/yr; styrene, 14,000 ton/yr; synthetic rubber, 45,000 ton/yr; benzene, and other intermediates.

TEXAS BUTADIENE & CHEMICAL CORP. Comodoro Rivadavia, Argentina.
Raw material: natural gas, styrene (from Koppers).
A $40 million plant scheduled for completion in 1962: butadiene, 20,000 ton/yr; synthetic rubber, 40,000 ton/yr; and carbon black.

A group comprising Fiat and Montecatini has requested 200 acres of land near San Nicolas, Buenos Aires Province, Argentina, from the Army Ordnance Work, for a petrochemical plant which would produce 18,000 ton/yr of urea, 94,000 ton/yr of ammonium nitrate, 10,000 ton/yr of dodecyl benzene, 2,000 ton/yr of phthalic anhydride, and 35,000 ton/yr of sulfuric acid.

Bolivia

BOLIVIAN OIL CO. S.A. is reported to be planning an 8,000 ton/yr carbon black plant.

Brazil

ADESIVOS E LACTICINIOS BRASIL-AMERICA (ALBA S/A). Caixa Postal 438, São Paulo, Brazil. Works manager, John V. Lynn.
Hydrocarbon raw materials: Bunker C fuel oil.
Products: Methanol, 7,500 metric ton/year.

BAKOL COMERCIO E INDUSTRIA S.A. Sao Paulo, Brazil.
Product: styrene, 10,000 ton/yr.

CIA. BRASILEIRA RHODIACETA (subsidiary of French firm Soc. Rhodiaceta) plans facilities to manufacture polyester fiber "Terylene" in Brazil, under exclusive patent rights obtained from Imperial Chemical Industries Ltd.

COMPANHIA BRASILEIRA DE ESTIRENO (subsidiary of Koppers Co.), Sao Paulo, Brazil.
Product: styrene, 10,000 ton/yr.

COMPANHIA DEODORO INDUSTRIAL. Sao Paulo, Brazil.
Product: Urea and formaldehyde, 4,500 ton/yr.

COMPANHIA PETROQUIMICA BRASILEIRA (associated with the Columbian Carbon Co. and Celanese Corp.), Sao Paulo, Brazil.
Product: Carbon black, 18,000 ton/yr.

COMPANHIA QUIMICA RHODIA BRASILEIRA (associated with Soc. Chimique du Rhone-Poulenc), Sao Paulo, Brazil.
Products: vinyl acetate, 4,000 ton/yr; nylons, 2,160 ton/yr.

CONTINENTAL CARBON-CELANESE is building a carbon black plant in Brazil, site not revealed.

DENTARIA BRASILEIRA INDUSTRIA E COMERCIO. Rua Tito, Sao Paulo, Brazil.
Product: acrylic resins, 75 ton/yr.

S.A. GEON DO BRASIL INDUSTRIA E COMERCIO, Sao Paulo, Brazil.
Product: polyvinyl chloride, 12,000 ton/yr.

INDUSTRIA CHEMICAL BRAZIL plans a Ziegler type plant to manufacture polyethylene, site not disclosed.

INDUSTRIAS QUIMICAS ELECTRO-CLORO S.A. Sao Paulo, Brazil.
Product: maleic anhydride, 720 ton/yr.

INDUSTRIAS QUIMICAS RESANA S.A. Sao Paulo, Brazil.
Product: maleic anhydride, 720 ton/yr.

NORTH AMERICAN SOLVAY INC. Sao Paulo, Brazil.
Under construction: a low-pressure polyethylene unit, completion scheduled for 1961.

PETROLATOS ZILCO LTDA. Rio de Janiero, Brazil.
Products: methanol and formaldehyde, 9,000 ton/yr.

PETROLEO BRASILEIRO S.A. (PETROBRAS), Cubatao, near Sao Paulo, Brazil.
F. Farios, Mgr.
Raw material: refinery gases.
Products: benzene, sulfuric acid, ammonia, carbon black, ethylene, propylene, nitric acid, nitrogenous fertilizers.

PETROLEO BRASILEIRO S.A. (PETROBRAS), near Rio de Janeiro, Brazil, is constructing a $6 million, 40,000 ton/yr GRS type snythetic rubber plant, adjacent the new Duque de Caxias refinery now being built. Petrobras will also install a benzene-toluene-xylenes unit and an ethylene recovery unit at this plant.

QUIMICA INDUSTRIAL BRASILEIRA S.A. Sao Paulo, Brazil.
Product: phenol, 3,000 ton/yr.

REFINARIA E EXPLORACAO DE PETROLEO "UNIAO" S.A., Capuava, Sao Paulo, Brazil.
Products: benzene, tetramer, sulfur, ammonia, methanol, higher alcohols, acetylene, vinyl derivatives, carbon black, solvents.

UNION CARBIDE. Cubatao, near Sao Paulo, Brazil.
Raw material: refinery streams.
Product: polyethylene, 4,500 ton/yr.
Company has requested government approval to increase capacity to 11,000 ton/yr.

VIDROPLAS COMPANHIA INDUSTRIAL DE PLASTICOS, Sao Paulo, Brazil.
Product: polyesters, 1,200 ton/yr.

Chile

REFINERIA CHILENA DE PETROLEOS y PETROQUIMICA S.A. Correo Estación Maipú, Santiago, Chile. Manager, Arturo Sramek.
Hydrocarbon raw material: refinery streams.
Products: aliphatic solvents, aromatic solvents, additives.

Colombia

B. F. GOODRICH CHEMICAL CO. and Colombian partners, plan a polyvinyl chloride plant near Bogota, Colombia.

W. R. GRACE & CO. CHEMICAL DIVISION will start construction soon near Bogota, Colombia, of a plant to produce phthalic anhydride and naphthalene.

INDUSTRIA COLOMBIANA DE FERTILIZANTES (Montecatini), Barrancabermeja, Colombia. General manager, Dario Trujillo.
Raw material: natural gas.
Products: ammonia, ammonium nitrate, nitric acid, and urea.

INTERNATIONAL PETROLEUM CO. (COLOMBIA) LTD. is constructing a $13 million, 300 ton/day ammonia and 150 ton/day nitric acid plant at the Cartegena, Colombia refinery. Completion planned for this year.

Costa Rica

FERTILIZANTES DE CENTRO AMERICA (FERTIGAS) etal, plans a $10 million, 650 ton/day nitrogenous fertilizer plant at an undisclosed site in Costa Rica. Products will include urea. Plant would operate on ammonia to come from new refinery-petrochemical facilities in El Salvador.

Netherlands Antilles

ARUBA CHEMICAL INDUSTRIES N.V. has indicated plans for a $96 million petrochemical complex to be built at Aruba, Netherlands Antilles, mainly to produce aromatics, ammonia, urea, and nitrogen fertilizers.

Peru

CORPORACION DE RECONSTRUCCION Y FOMENTO plans a $10 million, 62,000 ton/yr ammonium nitrate plant at an undisclosed site in Peru.

FERTILIZANTES SINTETICOS S.A. Lima, Peru. Manager, Enrico Berrini.
Hydrocarbon raw material: Bunker No. 6 oil.
Products: ammonia, 200 ton/yr; ammonium sulfate, 20,000 ton/yr; ammonium nitrates, 32,500 ton/yr; nitric acid (98%), 1,300 ton/yr; hydrogen, 100,000 cu. meter/yr; oxygen, 1,000,000 cu.m./yr; ammonia liquor, 100 ton/yr.

Puerto Rico

GONZALEZ CHEMICAL INDUSTRIES, INC. San Juan, Puerto Rico (vice president, R. Ogilvie) has plans to build an ammonia plant.

UNION CARBIDE CARIBE INC. will complete a $20 million 110 million lb/yr polyethylene plant at a site near Ponce, Puerto Rico, second half of 1962.

El Salvador

CONTINENTAL OIL CO. and **NATIONAL BULK CARRIERS INC.** have proposed to El Salvador government construction of a $6 million ammonia plant at Acajutla.

Trinidad

FEDERATION CHEMICALS LTD. (associated with W. R. Grace & Co.). Point Lisas, near Point-a-Pierre, Trinidad.
Raw materials: natural gas.
Products: ammonia, 36,500 ton/yr; urea, 25,500 ton/yr; ammonium sulfate, 89,500 ton/yr; sulfuric acid, 73,000 ton/yr.

Uruguay

ADMINISTRATION NATIONAL DE COMBUSTIBLES ALCOHOL Y PORTLAND, Montevideo, Uruguay, is building a 6 ton/day, sulfur plant.

Venezuela

INSTITUTO VENEZELANO DE PETROQUIMICA, Caracas, Venezuela, general manager, Dr. Gustavo Rivero N., will complete this year at Moron, Venezuela, a new petrochemical plant to operate on Barinas crude and natural gas. Products and output in metric ton/yr are: ammonia, 33,000; ammonium nitrate, 49,830; ammonium sulfate, 79,200; and urea, 16,500.

NEGROVEN, a consortium comprising United Carbon Co., Manufactura de Papel, Inversiones Dosco, and Grup Tecnico de Promocion Industrial, is building a $2 million, 20 million lb/yr carbon black plant at Valencia, Venezuela, under license by United Carbon. Contractor is The Lummus Co.

Western Europe

Austria

DANUBIA PETROCHEMIE A.G. Schwechat, near Vienna, Austria, has completed a 5,000 ton/yr polypropylene plant. Charge stock comes from new government refinery nearby.

FARBWERKE HOECHST, A.G. has plans for a new polyethylene plant at Schwechat, near Vienna, Austria. Ethylene feed (5,000 to 7,000 ton/yr) will come from OMV refinery just completed at Schwechat.

HIAG WERKE A.G., Austria.
Product: methanol, 10,000 ton/yr.

Belgium

AMOCO FINA in partnership with Standard Oil of Indiana is planning a petroleum additives plant at Antwerp, Belgium, for probable completion in 1962.

BRITISH CHROME & CHEMICALS is building a 100 ton/day sulfuric acid plant at Urlay Nook, Belgium.

CARBOCHIMIQUE is building a plant at Tertre, Belgium, with the following facilities: 100-150 ton/day ammonia via Texaco partial oxidation process.

COBENAM S.A. Antwerp, Belgium, expects to complete a 30 million lb/yr polyethylene plant late in 1961.

MONSANTO CHEMICAL CO. and **SOC. INDUSTRIELLE LA CELLULOSE S.A. (SIDAC)** have formed a new company, with headquarters in Brussels, Belgium, and will build a plant at Ghent to manufacture polyvinyl butyral plastic sheets. Completion planned by 1961.

SOC. CHIMIQUE DE SELZAETE will complete a plant at Selzaete, Belgium, in 1962, to produce maleic anhydride, using the Scientific Design Co. process.

SOC. CHIMIQUE DES DERIVES DU PETROLE, Antwerp, Belgium.
Products: ethylene oxide.

UNION CHIMIQUE BELGE is building a 5,000 ton/yr, $2 million phthalic anhydride plant at Schoonarde, Belgium. Badger N.V. has the contract.

Denmark

IMPERIAL CHEMICAL INDUSTRIES LTD. and two Danish companies plan a 15,000 ton/yr polyolefins facility at Maersk, Denmark, near Copenhagen.

France

ACETALACQ. Pardies, France.
Product: acetaldehyde, 25,000 ton/yr.

ANTAR PETROLES DE L'ATLANTIQUE. Donges, France.
Raw materials: aromatic and paraffinic hydrocarbons.
Products: benzene, toluene, xylenes, propylene, paraxylene, and solvents. Total aromatics, 75,000 ton/yr; paraxylene, 10,000 ton/yr.
Expansion in capacity planned by 1962.

AZOLACQ. Pardies, France.
Products: ammonium nitrate, 190,000 ton/yr; urea, 38,000 ton/yr.

CIE FRANCAISE DE MATIESES COLORANTES (Francolor) is building a phthalic anhydride-from-orthoxylene plane at Villers-St-Paul, France, the first to use the Scientific Design Co. process. Contractor is Soc. Francaise des Services Techniques, a member of the SD group.

CIE FRANCAISE DE RAFFINAGE, Gonfreville, France.
Products: ethylene, 30,000 ton/yr; tri- and tetra-propylene; heptane; isobutylene. All products, 80,000 ton/yr.
Under construction: ethylene, 50,000 ton/yr, propylene; butadiene; for completion 1963.

CIE FRANCAISE DU CARBON BLACK S.A. (Continental Carbon and Phillips Petroleum), Bec d'Ambes, Bordeaux, France.
Product: carbon black, 25,000 ton/yr.

DAUFAC (PROGIL, Ugine, St. Gobain, Rhone Poulenc). Jarnie, France.
Product: vinyl chloride monomers.

ESSO STANDARD S.A.F. Port Jerome, France.
Products: tri- and tetra-propylene, ethylene (36,000 ton/yr), propylene (30,000 ton/yr), butadiene (8,000 ton/yr), isobutylene, dodecyl benzene, orthoxylene (28,000 ton/yr), and paraxylene (16,000 ton/yr).
Planned: 45,000 ton/yr aromatics unit, for completion first half 1962.

ETHYL-SYNTHESE will build a 30,000 ton/yr styrene plant at Grand Quevilly, France, using the Koppers Co. high pressure process. Contractor is Soc. Belge de l'Azote et des Produits Chimique du Marly, of Liege, Belgium.

ETHYLENE PLASTIQUES-NORMANDIE, Lillebonne, France.
Product: high pressure polyethylene, 30,000 ton/yr.

ETHYLENE PLASTIQUE NORMANDIE plans a high pressure polyethylene plant at Lavera, France.

ETHYLENE PLASTIQUE-NORMANDIE plans a 30,000 ton/yr high pressure polyethylene plant at Mont, France by 1962.

FIRESTONE TIRE & RUBBER CO. expects to complete a 10,000 ton/yr synthetic rubber plant at Lillebonne, France, this year, and to add polybutadiene by 1962.

KUHLMANN. Paimboeuf, France.
Raw material, fuel oil.
Product: ammonia, methanol.
Planned: expansion of ammonia.

MANUFACTURE NORMANDE DE POLYETHYLENE (MANOLENE), Gonfreville, France.
Raw material: ethylene.
Product: polyethylene, 6,000 ton/yr.

METHANOLACQ, Pardies, France.
Product: methanol, 40,000 ton/yr.

NAPHTACHIMIE. Lavera, France.
Products: ethylene, 48,000 ton/yr; propylene, 52,000 ton/yr; butadiene, 7,000 ton/yr; ethylene oxide, 13.2 million lb/yr; ethylene glycol, 5.5 million lb/yr; ethanolamines, 5.5 million lb/yr; glycol ethers etc. 2.2 million lb/yr; acetone, 11 million lb/yr; isopropanol, 19.8 million lb/yr; polyethylene, 7 million lb/yr.
Planned: expansion of ethylene, propylene, and butadiene; propylene oxide; polypropylene; polyisobutylene.

NOBEL-BOZEL, Port Jerome, France.
Raw material: refinery gas.
Product: sulfur, 22,000 ton/yr.

OFFICE NATIONAL INDUSTRIEL DE L'AZOTE. Toulouse, France.
Raw material: heavy fuel oils.
Products: acetylene, ammonia (140,000 ton/yr), methanol.

OROGIL. Gonfreville, France.
Products: alkyl phenols, dopes.

PECHINEY. St. Auban, France.
Raw material: propane.
Products: perchlorethylene, carbon tetrachloride.
Construction: a 2 million lb/yr polypropylene unit (Montecatini license).

PETROPLASTIQUE (Cie. Francaise de Raffinage and El Paso France), Gonfreville.
Product: polyethylene, 20,000 ton/yr.
Planned: expansion by 1963.

PIERREFITTE. Soulom, France.
Raw material: natural gas.
Products: ammonia, 80,000 ton/yr; urea, 50,000 ton/yr.

PLASTICHIMIE S.A. (Pechiney and Dow Chemical International Ltd. S.A.) is building a polystyrene plant at Ribecourt, France. Completion date: 1961.

POLYMER CORP. LTD. (of Canada) expects to complete late in 1962 a $12 million, 10,000 ton/yr synthetic rubber specialties plant on a 175-acre site at La Wantzenay, France, near Strasbourg. Contractor is Badger (France) SaRL, with Badger N.V., a Dutch associate firm, to assist.

POTASSE ET ENGRAIS CHIMIQUES. Grand Couronne.
Products: ammonia and derivatives, 300,000 ton/yr.

PROGIL. Pont-de-Claix, France.
Products: perchloroethylene, carbon tetrachloride.

PROGIL-BAYER-UGINE. Pont-de-Claix, France.
Product: polyurethanes, 3,000 ton/yr.

REICHOLD CHEMICALS INC., Niort, France is building a 73,000 ton/yr formaldehyde plant, and also a 10.5 million lb/yr maleic anhydride plant, the latter to be designed by Scientific Design Co., Inc. and constructed by its French affiliate, Soc. Francaise des Services Techniques.

RHODIACETA. St. Fons, France.
Products: terephthalates from paraxylene and ethylene glycol.

ST. GOBAIN, Balaruc, France.
Raw material: refinery gas.
Product: sulfur.

ST. GOBAIN. Port de Bouc, France.
Raw material: refinery gas.
Product: sulfur.

SHELL-ST. GOBAIN. Berre, France.
Raw materials: refinery gases and liquids.
Products: isopropanol, diacetone, alcohol, butyl acetone, epoxy resins, carbon black, detergent bases, solvents.

SHELL-ST. GOBAIN. Petit Couronne, France.
Raw material: C_5+ plus kerosine.
Product: alkyl sulfate of soda (for use in detergents). Total, 35,000 ton/yr.

SOC. ATLANTIQUE PROGIL ELECTROCHIMIE, Donges, France.
Raw materials: propylene and benzene.
Product: cumene, 20,000 ton/yr.

SOC. CABOT-FRANCE. Berre, France. President, Denis E. O'Mulloy.
Product: carbon black, 45,000 ton/yr.

SOC. CHIMIQUE DE LA GRANDE PAROISSE. Donges, France.
Product: ammonia, 80,000 ton/yr.

SOC. CHIMIQUE DE LA GRANDE PAROISSE, Grand Quevilly, France.
Raw material: refinery gas.
Product: ammonia and derivatives.

SOC. DE PRODUCTS CHIMIQUES COURRIERES-KUHLMANN, Harnes, France.
Raw materials: butylene and propylene dimers, and propylene trimers.
Products: dodecylbenzene, ammonia, methanol, and oxo alcohols (18,000 ton/yr).

SOC. DE PRODUITS CHIMIQUES MARLES-KUHLMANN, Choques, France.
Raw material: propylene.
Products: propylene oxide and derivatives (15,000 ton/yr).

SOC. DE PRODUITS CHIMIQUES MARLES-KUHLMANN. Gonfreville, France.
Products: ethylene oxide and derivatives, 10,000 ton/yr.

SOC. DES ELASTOMERES DE SYNTHESE. Berre, France.
Products: butadiene-styrene rubber, 75,000 ton/yr.
Planned: expansion of butadiene and of SB rubber; new facilities for polybutadiene.

SOC. DES PRODUITS AZOTES, Lannemezan, France.
Products: ammonia, methanol, urea, nitrogen fertilizers.

SOC. DES PRODUITS CHIMIQUES D'AQUITAINE (AQUITAINE-CHEMIE). Lacq.
Products: ammonia (80,000 ton/yr), acetylene (41,000 ton/yr), methanol, polypropylene.

SOC. DES USINES CHIMIQUES RHONE-POULENC. Peage de Roussillon, France.
Raw materials: propylene, benzene, cumene.
Products: acetone, phenol cyclohexanol.
Planned: expansion of acetone and phenol; new facilities for dimethyl terephthalate (at St. Fons).

SOC. DU CAOUTCHOUC BUTYL (SOCABU), Port Jerome, France.
Raw material: isobutylene.
Product: butadiene, and butyl rubber (20,000 ton/yr).

SOC. INDUSTRIELLE DES DERIVES DE L'ACETYLENE (SIDA). La Chambre, France.
Raw materials: isopropanol, sec-butanol.
Products: diacetone alcohol, acetone, and methyl ethyl ketone.

SOC. INDUSTRIELLE DES DERIVES DE L'ACETYLENE (SIDA). Notre Dame de Granvenchon.
Products: sec-butanol (7,000 ton/yr) and derivatives.

SOC. NATIONALE DES PETROLES D'AQUITAINE. Lacq.
Raw material: natural gas.
Products: sulfur, 800,000 ton/yr; ethylene, 25,000 ton/yr; benzene, 70,000 ton/yr; cyclohexane, 20,000 ton/yr.
Planned: expansion of ethylene, benzene, and sulfur; installation of ammonia facilities.

SOC. NORMANDE DE MATIERE PLASTIQUE, Lillebonne, France.
Products: polyethylene, 7,000 ton/yr; polypropylene.

SOC. PETROSYNTHESE. Gonfreville, France.
Raw materials: benzene, tetrapropylene.
Product: dodecylbenzene, 24,000 ton/yr.

SOC. PETROSYNTHESE. Le Havre, France.
Products: alkylates, 15,000 ton/yr.

SOC. PROGIL-ELECTROCHIMIE. Pont de Claix, France.
Raw material: cumene.
Products: acetone, phenol, chlorinated hydrocarbons.

SOC. STANDARD-KUHLMANN, l'Estaque, France.
Raw materials: aromatic alkyls.
Products: detergents, 19.8 million lb/yr.

UGINE. Villiers St.-Sepulchre, France.
Product: nitrile type rubbers, 10,000 ton/yr.

UNITED CARBON FRANCE S.A. Port Jerome.
Product: carbon black, 25,000 ton/yr.

VINYLACQ, Pardies, France.
Product: vinyl chloride, 14,000 ton/yr.
Planned: expansion by 1962.

Germany (West)

BADISCHE ANILIN-UND SODA-FABRIK, Ludwigshafen, West Germany.
Products: styrene, polyethylene, methanol, isopropanol, acetone.

BP CALIFORNIA, a new joint venture of British Petroleum Co. and California Chemical Co. expects to complete a new aromatics plant adjacent the BP refinery at Dinslaken, West Germany, late in 1961. It is being built at same time as a similar installation at the Isle of Grain, Kent, England. Combined capacity of the two facilities will be orthoxylene, 19,000 ton/yr; ethyl benzene, 16,000 ton/yr; and para xylene, 22,000 ton/yr. Total investment involved in both plants will be about $19.6 million.

BUNAWERKE HUELS GmbH, Marl Kreis, Recklinghausen, West Germany. Chairman, supervisory board, Paul Baumann.
Hydrocarbon raw material: n-butane.
Products: SBR synthetic rubber, 70,000 ton/yr.
Construction: expansion of SBR production to 120,000 ton/yr.

CARBOSULF (a joint venture of Glanzstoff Courtaulds and Dr. Jacob, Chemische Fabrik) is building a 105 million lb/yr carbon disulfide plant at Cologne, West Germany. Completion is expected early in 1962.

CONDEA PETROCHEMIE GmbH (50-50 joint enterprise by Continental Oil Co. and Deutsche Erdoel), is building a 50,000 ton/yr alcohol plant (ALFOL process) on the Kiel Canal, north of Hamburg, Germany, with completion planned for mid-1963.

CHEMISCHE WERKE HOLTEN, Oberhausen, West Germany.
Products: ethylene oxide, ethylene glycols, estimated total capacity 44 million lb/yr.

CHEMISCHE WERKE HUELS A.G. Marl Kreis, Recklinghausen, West Germany. Chairman, Paul Baumann.
Principal products: chlorinated hydrocarbons, solvents and resins, detergent materials, glycols and derivatives, ethanol, carbon black, plastics, and plasticizers, butadiene (40,000 ton/yr.).
Huels plans to produce polybutadiene, using Ziegler-type catalyst under license from Studiengesellschaft Kohle GmbH. Company also plans a 6,000 ton/yr Ziegler process polyethylene plant.

DEUTSCHE ERDOEL A.G. Heide, West Germany.
Product: ethylene, 2 million lb/yr; propylene, 18 million lb/yr; sulfur, 5.3 million lb/yr.
Under construction: isobutylene, 11 million lb/yr, for completion this year.

DEUTSCHE SHELL, near Cologne, West Germany.
Raw material: refinery gas.
Product: ethylene.

ERDOELCHEMIE GmbH. Dormagen/Niederrhein, West Germany. Manager, Dr. Wilhelm Graulich.
Hydrocarbon raw material: light petroleum distillate.
Products: ethylene, 45,000 ton/yr; propylene, 40,000 ton/yr; ethylene oxide, 36,000 ton/yr; propylene oxide, 10,000 ton/yr.
Units under construction for completion in 1961: butadiene, 30,000 ton/yr; di- and tri-isobutylenes, 35,000 ton/yr; n-butenes, 40,000 ton/yr; glycols, 26,000 ton/yr.

ESSO A.G., Cologne, West Germany.
Raw material: refinery streams.
Products: butadienne 7,500 ton/yr; propylene, 35,000 ton/yr; ethylene, 45,000 ton/yr; isobutylene, methane, ethane, hydrogen, acetylene.

Under construction: $12 million expansion to double refinery yield of petrochemical plant feedstock, for completion this summer.

FARBWERKE HOECHST A.G. Gendorf, West Germany.
Products: ethylene oxide, ethylene glycol, other glycols and derivatives, detergents, nylon, antifreezes, emulsifiers, textile and agricultural chemicals, polyvinyl chloride, polyethylene (24,000 ton/yr), polypropylene (6,000 ton/yr), and other plastics, chloromethane.

FARBWERKE HOECHST A.G. Hoechst, West Germany.
Raw material: petroleum distillates.
Products: ethylene, propylene, ethanol, isopropanol acetone, polyethylene, polypropylene, fibers, films.
New ethylene and acetylene units under construction will raise total olefin capacity at Hoechst to about 130 million lb/yr.

FARBENFABRIKEN BAYER. Leverkusen, West Germany.
Products: rubber and fibers.

FELDMUBLE, Lulsdorf, West Germany, plans a 10,000 ton/yr. ethylene unit and a propylene unit.

HIBERNIA, Herne, West Germany.
Products: ethylene, polypropylene.

KOHLE-OEL-CHEMIE. Gelsenkirchen, West Germany.
Product: polyethylene.

PHENOLCHEMIE. Gladbeck, West Germany.
Products: phenol, acetone.

REICHHOLD CHEMIE, a joint venture of Reichhold Chemicals Co. and Deutsche Erdoel, plans a petrochemical plant at the North Sea port of Brusbuettelkoog, with completion expected this year.

RHEINISCHE OLEFINWERKE, Wesseling, near Cologne, West Germany.
Raw materials: refinery gases, light naphthas.
Products: ethyl benzene, 12,000 ton/yr; epoxy resins, 2,000 ton/yr; ethylene, 102 million lb/yr; high pressure polyethylene, 50,000 ton/yr; low pressure polyethylene, 6,000 ton/yr.
Expansion plans: by 1962 capacities are to be increased to the following: ethylene, 125,000 ton/yr; high-pressure polyethylene, 100,000 ton/yr; low-pressure polyethylene, 12,000 ton/yr. Total cost is estimated at $120 million.

RHEINPREUSSEN A.G. fuer BERGBAU UND CHEMIE. Homberg/Neiderrhein, Baumstrasse 31, West Germany. Plant manager, Dr. Herman Haeusser and Dr. Albert Meusel.
Products: i-propanol, sec-butanol, methyl ethyl ketone, dodecyl and keryl benzene and sulfonates, phthalic anhydride, oxo-alcohols, alkyl phenols, aluminum alcoholates, resins.
Under construction: 13 million lb/yr (initial capacity) maleic anhydride plant, using Scientific Design Co. process.

ROHM & HAAS, Darmstadt, West Germany.
Product: acrylic resins.

RUHRCHEMIE A.G. Oberhaussen-Holten, West Germany. Plant manager, Herr Knoellinger.
Under construction: polyethylene unit was reported.

SCHOLVEN-CHEMIE A.G., near Gelsenkirchen, West Germany plans a low pressure polyethylene plant.

UNION RHEINISCHE BRAUNKOHLEN-KRAFTSTOFF, Wesseling, West Germany. Managing director, Dr. Kurt Wissel.
Products: methanol, ammonia, urea (25,000 ton/yr).

WACKER CHEMIE, Burghausen, West Germany.
Products: trichlorethylene and vinyl acetate.

Greece

DOW CHEMICAL CO. plans a $1 million polystyrene plant at Athens, Greece; exact site not yet disclosed.

THE GREEK GOVERNMENT expects to complete by mid-1962 at Ptolemaeus, Greece, the following units: ammonia, 300 ton/day; sulfuric acid, 375 ton/day; ammonium sulfate, 525 ton/day; and ammonium nitrate, 325 ton/day. Contractors are Uhde and Casale. Chemical Construction (G.B.) Ltd. has the contract for the sulfuric acid unit.

Italy

AUGUSTA PETROL. CHIMCA (Montecatini Group), Priolo, Sicily, Italy.
Raw material: refinery streams, from RASIOM plant.
Products: ammonia (30,000 ton/yr), nitrogenous fertilizers.

ASFALTI BITUMI CEMENTI e DERIVATI S.A. (ABCD), Ragusa, Italy.
Products: ethylene, propylene, butylene, polyethylene (12,000 ton/yr).

ANIC GELA SpA (AZIENDA NAZIONALE IDROGENAZIONE COMBUSTIBIL) is building facilities at Gela, Sicily, Italy to manufacture: sulfuric acid, 110,000 ton/yr; ammonium sulfate, 150,000 ton/yr; urea, 60,000 ton/yr; tetrapropylene, 4,000 ton/yr; polyethylene, 15,000 ton/yr; ethanolamines and glycols, 17,000 ton/yr.

ANIC SpA. Ravenna, Italy. General manager, Angelo Fornara.
Products: acetylene, butadiene, (20,000 ton/yr), styrene, vinyl and polyvinyl chloride, acetaldehyde, synthetic rubber (80,000 ton/yr), carbon black, ammonia, nitric acid, ammonium nitrate, calcium nitrate, ammonium sulfate, urea, fertilizers (total, 800,000 ton/yr), a polymer of acrylonitrile-butadiene-styrene.
Under construction: ethylene; expansion of synthetic rubber (to 90,000 ton/yr); butadiene, 80,000 ton/yr).

AZIENDA COLORI NAZIONALI AFFINI (Montecatini Group) Cengio, Italy, near Milan.
Product: phthalic anhydride, 22 million lb/yr.
New plant, on stream early this year, and built by Badger Mfg. Co. using Sherwin-William fluid process.

BOMBRINI-PARODI-DELFINO SpA (BPD Group) has awarded a contract to Scientific Design Co. Inc. for a 10 million lb/yr maleic anhydride plant at Colleferro, Italy, for completion mid-1962.

COLUMBIAN CARBON EUROPA. Trecate, near Milan.
Product: carbon black, 60 million lb/yr.

DISTILLERIE ITALIANE. Limito, near Milan.
Product: butanol, 11,000 ton/yr.

DOW CHIMICA ITALIANA SpA is constructing a 16,000 ton/yr polystyrene plant at Livorno, Italy, with completion expected in 1962. Foster Wheeler is the contractor.

FTALITAL SpA., Scanzorosciate (Bergamo), Italy.
Products: phthalic and maleic anhydride.
Maleic capacity is being raised from present 1,500 to 10,000 ton/yr. Scientific Design Co. is the contractor.

MOBIL CHEMICA ITALIANA SpA, newly formed Italian affiliate of Socony Mobil, will build a petrochemical plant at Naples with an initial output estimated at 39 million gal/yr, of which more than 75% will be benzene and orthoxylene.

MONTECATINI, Brindisi, Italy has begun construction of a $95 million plant to use approximately 1.3 million ton/yr of raw materials and produce polyethylene (30,000 ton/yr), isotactic polypropylene, polymers for synthetic fiber, aldehydes, alcohols, and solvents. Completion is anticipated in early 1962.

MONTECATINI, Castellanza, Italy.
Products: formaldehyde, resins.

MONTECATINI, Ferrara, Italy.
Raw materials: methane, liquid hydrocarbons and refinery gases.
Products: ammonia, ethylene (24,000 ton/yr), propylene (30,000 ton/yr), polymers.
Polypropylene unit is undergoing expansion.

MONTECATINI, Novara, Italy.
Raw material: methane.
Products: ammonia, methanol, urea, acetylene.

MONTECATINI, Rho, near Milan.
Raw materials: liquid hydrocarbons and refinery streams.
Products: acrylic derivatives, 10,000 ton/yr; hydrocyanic acid and derivatives, 12,000 ton/yr.

MONTECATINI. Terni.
Product: polypropylene staple fiber ("Meraklon"), 30,000 ton/yr.

PHILLIPS CARBON BLACK ITALIANA SpA (a new company formed by Phillips Petroleum Co. and ANIC SpA), expects to complete by 1962 a new 25 million lb/yr carbon black plant near Ravenna.

RUMIANCA SpA plans a $3 million, 10,000 ton/yr polyvinyl chloride plant at Pieve Vergonte, Italy, with completion in mid-1962.

SHELL ITALIANA expected to complete this summer a plant for production of 100,000 ton/yr of aromatic solvents at its Rho, Italy, refinery, near Milan.

SINCAT (affiliate of Industriale Catonese and Cia Edison) Priolo, near Syracuse, Italy (Sicily).
Raw materials: refinery streams.
Products: ethylene, propylene, other olefins.
Planned: a 240 ton/day ammonia unit.

SIR, Porto Torres, Sardinia, plans facilities to produce ethylene, propylene, ethanol, and propylene tetramer.

SIR, Milan, Italy.
Product: dodecylbenzene.

SIR, Varese, Italy.
Products: tetrapropylene, cumene, phenol.

SISAS, Milan, Italy.
Raw material: methane.
Products: acetylene (12,000 ton/yr), acetic derivatives.

SNIA VISCOSA. Varedo, near Milan.
Product: carbon disulfide, 20 million lb/yr.

SOCIETA ANONIMA RAFFINAZIONE OLII MINERALI (SAROM), Ravenna, Italy. General manager, Bruno Riffeser.
Products: sulfur, 34 ton/day.

SOC. CABOT ITALIANA. Ravenna.
Product: carbon black, 14,000 ton/yr.

SOC. CHIMICA RAVENNA (associated with ANIC), Ravenna, Italy.
Product: vinyl chloride.

SOC. EDISON, Mantua, Italy.
Raw materials: liquid hydrocarbons and refinery gases.
Products: butadiene, 3,750 ton/yr; olefins, 25,000 ton/yr.

SOC. EDISON, Porto Marghera (Venice), Italy.
Raw materials: methane.
Products: ammonia, acetylene, acetic and vinyl derivatives.
Under construction: phenol-acetone unit.

SOC. SOLVAY, Rosignano, (near Livorno), Italy.
Product: polyethylene, 12,000 ton/yr.

SpA CELENE (Edison Group and Union Carbide), Priolo, Sicily, Italy.
Products: ethylene, ethylene oxide, propylene axide, polyethylene, ethanol, butanol, 2-ethyl hexanol, and ethanolamines.
Under construction: expansion of polyethylene to 60 million lb/yr.

VETROCOKE, Marghera, Italy.
Raw material: methane.
Product: ammonia.

Netherlands

ALBATROS SULFURIC ACID AND CHEMICAL WORKS plans a plant at Vlaardingen, Netherlands. Chemical Construction Co. has two contracts: one for a 100,000 ton/yr sulfuric acid plant and the other to decompose sulfuric acid sludge from the adjacent Shell refinery.

ALCHEMICA N.V., a subsidiary of Archer-Daniels-Midland Co. of USA, expects to complete a 1,200 ton/yr phthalic anhydride plant in 1962 at an undisclosed site.

CALTEX PETROLEUM Mij (NEDERLAND), Pernis, the Netherlands.
Raw material: refinery gas.
Product: sulfur, 8 long ton/day.

CHEMISCHE INDUSTRIES UITHOORN N.V. is constructing a $1.9 million, 5,000 ton/yr phthalic anhydride plant at Uithoorn, Netherlands, to process either naphthalene or orthoxylene.

CONTINENTAL CARBON — NETHERLANDS, Rotterdam, the Netherlands, is scheduled to complete this year its $2.5 million, 30 million lb/yr carbon black plant.

E. I. DU PONT DE NEMOURS & CO. plans a 15 million lb/yr acrylic fibers plant at Dordrecht, The Netherlands.

ESSO NEDERLAND N.V. will complete at mid-1963 a $17 million, 220,000 ton/yr aromatic plant (benzene, toluene, xylene, and xylene-related products), at Rotterdam, Netherlands.

B. F. GOODRICH AND ALGEMEINE plans a butadiene plant at Arnheim, the Netherlands.

IMPERIAL CHEMICAL INDUSTRIES LTD. has plans for a $280 million petrochemicals investment over the next ten years on a 300-acre site near Rotterdam, Netherlands. Initial construction is expected to start some time next year.

KETJEN CARBON CO. LTD. Rotterdam, Netherlands.
Product: carbon black, 24,000 ton/yr.

KONINKLIJKE ZWAVELZUURFABRIEKEN. Amsterdam, Netherlands.
Product: phenol.

KUNSTZIJDE UNIE N.V. plans a styrene plant in the Netherlands; site not disclosed.

NEDERLANDSCHE DOW MIJ N.V. will complete a $2 million styrene-butadiene latex plant in 1961 at Botlek, Netherlands.

NETHERLANDS STAATS MIJNEN. Limburg, Netherlands.
Raw material: refinery naphtha (from Esso).
Product: ethylene, 25,000 ton/yr.
Under construction: polyethylene, 35,000 ton/yr; formaldehyde, 25,000 ton/yr; phthalic anhydride. The latter facilities being built by Scientific Design Co.

N.V. MAATSCHAPPIJ TOT EXPLOITATIE VAN KOOKSOVENGASSEN (MEKOG). Ijmuiden, Netherlands, near Pernis, has awarded an engineering contract for a 285 ton/day ammonium nitrate plant to Soc. Belge de l'Azote et des Produits Chimiques du Marly (SBA).

N.V. ROTTERDAMSE POLYOLEFINEN MIJ. formed by the Royal Dutch/Shell and Montecatini, (60-40 basis) will build and operate a polypropylene plant to operate on feedstock from Shell's Pernis refinery.

ROYAL DUTCH/SHELL GROUP. Pernis (Rotterdam), the Netherlands.
Raw material: refinery streams.
Products: sulfur, synthetic detergents, polyvinyl chloride, resins, solvents, insecticides, alkyl chloride, epichlorhydrin, synthetic glycerine, styrene-butadiene rubbers (60,000 ton/yr).
Construction is planned of polyisoprene and polybutadiene facilities.

Portugal

AMONIACO PORTUGUES. Estarreja, Portugal, near Oporto.
Raw material: low octane gasoline.
Products: ammonia, 85,000 ton/yr; ammonium sulfate, 110,000 ton/yr.

NITRATORS DE PORTUGAL is nearing completion of a fertilizer plant adjacent to Cabo Ruivo, Portugal, refinery of SACOR (near Lisbon). It will use part of ammonia output of Soc. Portuguese de Petroquimica to produce an estimated 100,000 ton/yr of calcium ammonium nitrate.

SOC. PORTUGUESA DE PETROQUIMICA. Lisbon, Portugal. President: Antonio Herculano de Carvalho.
Raw material: refinery gas.
Products: ammonia, 62,000 ton/yr; fuel gas, and hydrogen.

RESINAS SINTICAS. Lisbon, Portugal.
Products: maleic, alkyd, and phenolic resins, 600 ton/yr; and urea-formaldehyde, 1,000 ton/yr.

UNIAO FABRIL DO AZOTO. Labradio, near Barreiro, Portugal.
Product: ammonium sulfate, 70,000 ton/yr.
Planned: expansion of fertilizer facilities, for completion in 1962, including ammonia, 66,000 ton/yr; urea, 40,500 ton/yr; nitric acid, ammonium nitrate, and nitro-limestone. M. W. Kellogg has contract for ammonia and urea units. C&I Girdler International has contract for acid, nitrate, and limestone plants.

Spain

ABONOS SEVILLA S.A. plans an ammonia fertilizers plant at Seville, with completion probably in 1963. Output in terms of nitrogen would be 25,000 ton/yr.

AMONIACO ESPANOL S.A. is considering construction of an ammonia fertilizers plant at Malaga, with completion in 1963 or 1964.

CEPSA AND STANDARD OIL (N.J.) are seeking Spanish government approval to establish a $10 million, 24,000 ton/yr petrochemical plant in northern Spain. Products planned include materials for detergents, plastics and rubber. Ultimate investment in the plant would reach some $26 million.

CIA. ARAGONESA DE INDUSTRIAS QUMICA S.A. Sabinanigo, Spain.
Product: urea, 1,500 ton/yr.

CIA. INSULAR DEL NITROGENO S.A. (CINSA). Las Palmas, Canary Islands.
Raw materials: refinery gas.
Products: ammonia, 33,000 ton/yr; ammonium sulfate, 110,000 ton/yr.

DOW UNQUINESA (Dow Chemical Co.'s Spanish affiliate) has received government approval for its plan for an $20 million petrochemical plant at Bilboa, Spain, for completion in 1963. Products planned include ethylene, propylene, and their polymers.

INI, the Spanish government company, has asked Hoechst A.G. to join in their planned $70 million petrochemical plant at Puertollano, Spain, products to include low pressure process polyethylene.

MONSANTO IBERICA S.A., newly formed joint enterprise of Monsanto Overseas S.A. and Aiscondel S.A., of Barcelona, expects to complete this year a plant to manufacture calcium carbide, acetylene, and acetylene derivatives.

REFINERIA DE PETROLEOS DE ESCOMBRERAS S.A. (REPESA) plans a $15 million, 90,000 ton/yr fertilizer plant for completion in 1962 at Cartagena, Spain. Products will include ammonia, ammonium sulfate, sulfuric acid, and urea (73,000 ton/yr).

THE SHELL GROUP and a Spanish partner, Union Espanola de Explosivos, are seeking government approval to build a $56 million petrochemical plant in Spain.

Sweden

A GROUP OF SEVERAL COMPANIES have reached an agreement to build a $40 million petrochemical complex at Stenungsrund, Sweden, on the west coast and north of Gothenburg, with completion scheduled for summer of 1963.

Svenska Esso AB (Jersey Standard affiliate) is building a steam cracking plant which will produce 75,000 ton/yr of ethylene, plus propylene and butadiene. The Fluor Corp. Ltd. has the contract. The company has also obtained a license from Montecatini to make and sell polypropylene in the Scandinavian market.

Stockholm Superfosfat Farbricks AB has joined with Union Carbide to construct a 15,000 ton/yr polyethylene plant, to operate on Esso's ethylene output.

Mo och Domsjo, another Swedish company, is building a 33 million lb/yr ethylene oxide plant, also to use a part of Esso's ethylene output. Scientific Design Co. has the contract. They will produce ethylene glycol as a final product.

Switzerland

REICHHOLD CHEMICALS CORP. Hausen bei Brugg, Switzerland.
Product: phthalic anhydride, 10,000 ton/yr.

United Kingdom

BRITISH CELANESE CO. LTD. (Courtaulds Ltd.), Spondon, Derby, England.
Raw material: from thermal cracking (capacity recently increased by 40%).
Products: ethanol, isopropanol, acetone, butadiene, and aromatic hydrocarbons.
Under construction: aromatics unit to produce nitration grades of benzene, toluene, xylenes; and a cyclopentadiene recovery unit, all for completion in August.

BRITISH GEON LTD. (55% Distillers Corp. and 45% B. F. Goodrich Co.), Barry, South Wales, England, will complete a $7.6 million expansion to the polyvinyl chloride plant this summer, and then plans a further expansion for completion mid-1962, to reach a final capacity of about 45,000 ton/yr.

BRITISH HYDROCARBON CHEMICALS LTD. (50-50 British Petroleum and Distillers Co.) plans a new petrochemical complex with an initial investment of $28 million at Baglan Bay, a few miles from the BP refinery at Llandarcy, Wales, England. Operations generally will follow those at the firm's Grangemouth plant. A steam cracker for olefin manufacture is due for completion late in 1962.

BRITISH HYDROCARBON CHEMICALS LTD. (owned 50-50 by British Petroleum Co. Ltd. and Distillers Co. Ltd.) Grangemouth, Scotland. General manager, C. F. Evans.
Raw materials: naphtha.
Products: ethylene, 60,000 ton/yr; ethanol, 70,000 ton/yr; diethyl ether; polyethylene, 11,000 ton/yr; propylene; isopropanol, 30,000 ton/yr; cumene, 30,000 ton/yr; acetone, tetrapropylene, 20,000 ton/yr; butadiene, 10,000 ton/yr; phenols, 12,000 ton/yr.
A new unit doubling the productive capacity for ethylene was scheduled for completion the middle of this year. Three new units costing $14 million are to be built for manufacture of butadiene, ethylene dichloride and methanol. Completion date: 1961. Fluor Engineering and Construction Co. Ltd. has the contract for the butadiene unit.

BRITISH PETROLEUM CO. LTD., Grangemouth, Scotland.
Raw material: refinery gas.
Product: sulfur, 20 ton/day.

BRITISH PETROLEUM CO. LTD., Kent, England.
Raw material: refinery gas.
Products: sulfur, 15,400 ton/yr; solvents, 30,000 ton/yr.

BP CALIFORNIA LTD. (joint enterprise by British Petroleum Co. and California Chemical Co.) expects to complete late this year a $19.6 million venture involving new plants adjacent BP refineries at the Isle of Grain, Kent, England, and Dinslaken, West Germany. Combined output planned (in ton/yr): orthoxylene, 19,000; paraxylene, 22,000; and ethyl benzene, 16,000.

CABOT CARBON LTD., Stanlow, Cheshire, England. Managing director, George H. Cash.
Raw material: petroleum fractions.
Product: carbon blacks, 55,000 ton/yr.

CHEMSTRAND LTD. Coleraine, Northern Ireland. General manager, T. H. Makepeace.
Product: acrylic fiber ("Acrilan"), 10 million lb/yr.

DISTILLERS CO. LTD. plans a $5.6 million acetic acid plant, first of its kind in Europe, at Hull, England, with completion early in 1962, using a new process developed by the company, based on the direct oxidation of a light petroleum fraction.

DISTRENE LTD. (associated with Dow Chemical International), Barry, Wales, England.
Product: polystyrene.

ESSO PETROLEUM LTD. Fawley, Hythe, England.
Raw materials: virgin naphtha, C_3/C_4 olefins.
Products: ethylene, 40,000 ton/yr; butadiene, 40,000 ton/yr; heptene, 20,000 ton/yr; sulfur, 20,000 ton/yr.
Construction: $2.8 million lube oil additives plant, with expected capacity of 14,000 long ton/yr. Planned: $15.5 million in additional facilities to produce ethylene, butylene, and propylene, by end 1961. Also, a $12 million, 30,000 ton/yr butyl rubber plant. Contractor is Foster Wheeler Ltd., due for completion by end-1962.

ESSO PETROLEUM LTD. and **FISONS LTD.** have formed a joint enterprise to build a 150,000 ton/yr ammonia plant adjacent Esso's Milford Haven, England, refinery. This facility and a separate nitrogen products plant to be built by Fisons are expected onstream by the spring of 1964.

FORTH CHEMICALS LTD. (British Hydrocarbon Chemicals Ltd. and Monsanto Chemicals Ltd.), Grangemouth, Scotland. General manager, C. E. Evans.
Raw materials: ethylene and benzene.
Products: styrene monomer (50,000 ton/yr) and toluene.

FORTH CHEMICALS LTD. is constructing a new $8.4 million, 50,000 ton/yr styrene monomer plant at Baglan Bay, between Port Talbot and Neath, South Wales, England, with completion expected near the end of 1962. Design and engineering will be carried out by Monsanto Chemicals Ltd.

GRANGE CHEMICALS LTD. (British Hydrocarbon Chemicals Ltd. and Oronite Ltd.) Grangemouth, Scotland. General manager, C. E. Evans.
Raw material: tetrapropylene and benzene.
Product: dodecyl benzene.

GRANGE CHEMICALS LTD. plans a 15,000 ton/yr phthalic anhydride plant at Hull, England, near the new plant being built by Distillers Co. Ltd. Badger Ltd. has the contract.

IMPERIAL CHEMICAL INDUSTRIES LTD. Billingham, England.
Product: anhydrous ammonia, 60,000 ton/yr; phenol, 20,000 ton/yr.
Construction: carbonylation alcohol capacity increase to more than 140,000 ton/yr. A new $14 million hydrogen unit using a new ICI process based on light oil instead of coke, and due onstream in 1963.

IMPERIAL CHEMICAL INDUSTRIES LTD. Heysham, Lancashire, England.
Products: methanol, 30,000 ton/yr.
An expansion to 75,000 ton/yr will be completed in 1962, according to present plans.

IMPERIAL CHEMICAL INDUSTRIES LTD. Severnside, Avonmouth, England, has long range plans for an eventual $282 million petrochemical facility. First phase involves $14 million on two plants to make 35,000 ton/yr of ethylene oxide, ethylene glycol, and associated products (from ethylene piped from Esso Petroleum's Fawley refinery), to be completed in 1962. Second phase will be $10 million, 100,000 ton/yr ammonia plant (and associated derivatives), to be completed in 1963.

IMPERIAL CHEMICAL INDUSTRIES LTD. Wilton, England.
Principal products: ethylene (about 140,000 ton/yr), propylene (80,000 ton/yr), butylenes, polyethylene (105,000 ton/yr), ethylene oxide, ethylene glycol (16,000 ton/yr), paraxylenes, hydrogen cyanide, aceton, butanol, isobutanol, polypropylene (11,000 ton/yr), alkylated phenols, butadiene, terephthalic acid (50 million lb/yr), and many others.
Construction: maleic anhydride, 10,000 ton/yr; polypropylene expansion to 22,000 ton/yr.

INTERNATIONAL SYNTHETIC RUBBER CO. LTD. Fawley, Hampshire, England. General manager, D. A. Bennett.
Raw materials: butadiene and styrene.
Products: synthetic rubbers, 90,000 ton/yr.
Under construction: doubling capacity for high solids latex, to 7,000 ton/yr.

LOBITOS OILFIELDS LTD., Ellesmere Port, Cheshire, England.
Products: petroleum sulfonates, 150 b/d.

MANCHESTER OIL REFINERY (Lobitos Oilfields Ltd.). Trafford Park, Manchester, England.
Products: petroleum sulfonates, 300 b/d. Facilities are being expanded.

MONSANTO CHEMICALS LTD. Fawley Works, Hythe, Hampshire, England.
Raw material: ethylene.
Product: polyethylene (rated capacity of 10,000 ton/yr already raised to 17,000 ton/yr, and further expansion is contemplated).
Planned: additional polystyrene and rubber chemicals capacity. Expansion in polyethylene to about 25,000 ton/yr is planned for completion in early 1963.

MONSANTO CHEMICALS LTD. Newport, South Wales, England.
Product: maleic anhydride, 15 million lb/yr.
Construction: styrene-butadiene resins and latices, 5,000 ton/yr.

OROBIS LTD. Salt End, Hedon, Hull, Yorkshire, England. Plant manager: H. Burnham.
Hydrocarbon raw materials, petroleum sulfonates lube stocks, etc.
Products: lube oil additives, 3,000 to 5,000 ton/yr.

PETROCHEMICALS LTD. (Shell Chemicals Ltd), Carrington, Cheshire, England.
Raw material: naphtha.
Products: ethylene, propylene, ethylene oxide (45,000 ton/yr) polyethylene, propylene oxide, benzene, toluene, xylenes, isopropanol, glycol ethers, ethylene glycols, ethanolamines, polyethylene glycols, propylene glycols, polypropylene glycols, ethylene oxide condensates, phenols, cresols, alcohols, isopropanolamines, octyl phenol and octyl cresol condensates.
Ethylene oxide capacity is being increased by 20,000 to 45,000 ton/yr. A new 18,000 ton/yr monostyrene unit came on stream recently. A 30,000 ton/yr plant for polyethylenes and polypropylene is under construction.
Planned: commercial production of polybutadiene rubbers, with completion about 1963.

PETROLITE LTD. Liverpool, England.
Raw materials: petroleum fractions and chemicals.
Products: corrosion inhibitors, demulsifiers, water flood additives, fuel additives, asphalt additives, desalting chemicals, and the like.

PHILBLACK LTD. Avonmouth, Bristol, England. General works manager, G. P. Jennings.
Hydrocarbon raw material: petroleum fractions, heavy residual oil.
Products: furnace blacks, 150,000 lb/yr.

POLYMER CORP. LTD., the Canadian government rubber company, plans a butyl rubber plant in England.

REVERTEX LTD. and **INTERNATIONAL LATEX CORP.** have formed a new company to build a synthetic rubber latex plant. No further information has been disclosed, but a 60-acre site has been acquired near Grimbley, Lincolnshire, England.

SCOTTISH OILS LTD. Pumpherston, Midlothian, Scotland.
Raw material: shale oil fractions.
Product: detergents.

SHELL CHEMICAL CO. LTD. Carrington, England.
Products: ethylene, propylene, styrene, ethylene oxide, polyethylene, propylene oxide, benzene, toluene, xylenes, polystyrenes, isopropanol, glycol ethers, ethylene glycols, ethanolamines, polyethylene glycols, propylene glycols, propanolamine, polypropylene glycols, ethylene oxide condensates, phenols, cresols, alcohols, isopropanolamines, ethylene glycol ethers, and octyl phenol condensates.
Construction: for completion this year: ethylene oxide increase to 40,000 ton/yr; polyethylene and polypropylene, 30,000 ton/yr. For completion about 1962-1963, polyisoprene and polybutadiene.

SHELL CHEMICAL CO. LTD. Shellhaven, Essex, England.
Raw material: refinery gases.
Products: some olefins sold to other manufacturers, drous ammonia (75,000 ton/yr), nitrogenous fertilizers, and sulfur.

SHELL CHEMICAL CO. LTD. Stanlow, Cheshire, England.
Raw material: refinery gases.
Products: dodecyl benzene (30,000 ton/yr), anhythe balance used to produce resins, solvents (40,000 ton/yr), sulfur, naphthenic acids, naphthenic sulfonates, and synthetic detergents. Plant produces naphtha feed for Carrington (Styrene Products Ltd.), sent by 23-mile underground pipeline.

STO-CHEM LTD. (Witco Chemical Co. and United States Rubber Co.) is building a $2.8 million, 8 million lb/yr plant for synthetic rubber latices at Stoke Prior, Worcestershire, England, with completion expected late this year.

STYRENE PRODUCTS LTD. (Shell Chemical Co. Ltd.) Carrington, Cheshire, England.
Products: polystyrenes.

UNION CARBIDE LTD. Chemical Div. Hythe, Hampshire, England. Director and general manager: James F. Widman.
Raw material: ethylene (from Esso Petroleum at Fawley).
Products: ethylene oxide and derivatives, 45 million lb/yr.

UNION CARBIDE LTD. Polyethylene Div. Grangemouth, Scotland. Director and general manager: L. E. Whitmore.
Products: polyethylene (high pressure), 60 million lb/yr.

Yugoslavia

ORGANSKO KENIJSKA INDUSTRIJA plans a $35 million petrochemical plant at Zagreb, Yugoslavia, to operate on natural gas and produce polyethylene, polystyrene, detergents, and rubber. Foster Wheeler Corp. is providing engineering, and will supervise construction.

RUDNAP is constructing an $8 million synthetic fertilizer plant at Lukavaz, Bosnia, Yugoslavia, to produce anhydrous ammonia, 36,500 ton/yr; nitric acid, 124,000 ton/yr; and calcium nitrate, 138,000 ton/yr. It has signed an agreement with Montecatini and Ansaldo, both of Italy.

YUGOSLAV GOVERNMENT is building a $5.6 million acrylonitrile plant at Skopje, Macedonia, Yugoslavia. Equipment will be supplied by Courtaulds Ltd. of UK.

Africa and Middle East

Algeria

ALGERIENNE DE PETROCHIMIE (Progil 12.5%, Progil-Electrochimie 12.5%, Ugine 12.5%, Nobel-Bozel 12.5%, Gaz Lebon 12.5%, banks 12.5%) is considering a petrochemical plant at Algiers.

ALGERIENNE DE POLYMERISATION DES OLEFINES (Houilleres 50%, HGD 22.5%, Seichimie 21%, Pechiney 4%, Air Liquide 2.5%) plans a 10,000 to 20,000 ton/yr olefin copolymers plant at Algiers.

AZOTAL (Grande Paroisse 13%, Kuhlmann 12.25%, Houilleres 12.25%, ONIA 7.25%, Pierrefitte 7.25%, St. Gobain 3.65%, Air Liquide ?%) is considering an ammonia plant at Oran, Algeria.

PETRAL (PETROCHIMIE ALGERIENNE). (Air Liquide, Rhone-Poulenc, Kuhlmann, Pierrefitte, equal shares) plans a 50,000 ton/yr ammonium nitrates and urea plant at Oran, Algeria.

Iran

IRANIAN GOVERNMENT is building a nitrogen fertilizer plant at Marvdasht, near Shiraz, Iran, to operate on natural gas from Gach Saran field, with a capacity of 110 ton/day. Montecatini is the licensor. Completion, late 1962. Ensa (France) is general contractor for nitric acid and ammonium nitrate unit.

MONTECATINI expected to complete this year a 4,000 ton/yr polyvinyl chloride plant at Ahwaz, Iran, to operate on gas from the Agha Jari field.

Iraq

IRAQI GOVERNMENT plans a fertilizer plant in the Basrah area, operating on natural gas as feedstock.

Israel

ISRAELI GOVERNMENT, along with foreign private investors, are constructing a $14 million, 12,000 ton/yr ethylene unit at the refinery at Haifa. Negotiations are under way for the installation of a $5 million polyethylene plant and carbon black manufacturing facilities at Haifa also.

Kuwait

KUWAIT PETROCHEMICALS CO. LTD. a new firm capitalized at $45 million (Kuwait government 40%, Oronzio de Nora, Milan, Italy construction firm 40%; Kuwait National Petroleum 5%, private interests 15%) has been authorized by the Sheikh to build a new plant to produce ammonia, acetylene, polyvinyl chloride, chlorine, urea, caustic soda, oxygen and hydrogen. No further details were disclosed.

Lebanon

A GROUP OF LEBANESE businessmen are planning to build a new ammonia plant near one of the two petroleum refineries in Lebanon. No further information has been reported.

Morocco

THE SHELL GROUP has reached an agreement with the government of Morocco to construct and operate an $18 million, 110,000 ton/yr ammonium phosphate plant at the Atlantic port of Safi, Morocco, with completion about 1963. The government anticipates an over-all investment of $50 million in a chemical industry at Safi, including a natural gas pipeline from Mogador and a $24 million sulfuric acid, phosphoric acid plant.

Rhodesia

AFRICAN EXPLOSIVES AND CHEMICAL INDUSTRIES (RHODESIA) LTD., expects to complete in 1965 a $27 million nitrogen plant at Salisbury, Southern Rhodesia.

South Africa

AFRICAN EXPLOSIVES & CHEMICAL INDUSTRIES (subsidiary of Imperial Chemical Industries) is constructing a 70,000 ton/yr synthetic ammonia plant at Nodderfontein, South Africa. Plant would also produce methanol, formaldehyde, and urea-formaldehyde resins.

PHILLIPS CARBON BLACK CO. LTD., Port Elizabeth, South Africa.
Product: carbon black, 22 million lb/yr.
New $2.8 million plant, completed this spring.

S.A. COAL, OIL AND GAS CORP. LTD. Sasolburg, South Africa. Managing director: P. E. Rousseau.
Raw material: gasification of coal.

Petrochemical products: alcohols, 444,000 gal/yr; ketones, 200,000 gal/yr.

Planned: synthetic ammonia unit, for completion end of 1963.

Asia and Far East

Australia

AUSTRALIAN CARBON BLACK PTY. LTD., Altona, Victoria, Australia.
Product: carbon black, 25 million lb/yr.

AUSTRALIAN PETROCHEMICALS LTD., Silverwater, near Sydney, Australia, has a $4.5 million, monostyrene plant scheduled for completion in 1961. General manager is M. R. Holmes.

AUSTRALIAN SYNTHETIC RUBBER CO. LTD. (Stanvac and Goodyear), Altona, Victoria, Australia, has an $11 million, 30,000 ton/yr synthetic rubber plant scheduled for completion at mid-1961.

CSR CHEMICALS, PTY, LTD. OF AUSTRALIA. Rhodes, New South Wales, Australia.
Product: polystyrene plastic.

CSRC-DOW PTY LTD., Altona, Victoria, Australia, is building a plant to produce monostyrene, ethylene dichloride, caustic soda, and chlorine, at a cost of about $12.5 million.

IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA AND NEW ZEALAND LTD. Botany, near Clyde, Australia.
Product: polyethylene.
Plant is being expanded to operate on ethylene from nearby Shell Chemical when the latter plant goes on stream sometime in 1963. Cost will be $5 million; expected capacity will be 5,000 ton/yr.

MONSANTO CHEMICALS (AUSTRALIA) LTD. and CONSOLIDATED ZINC PTY LTD. OF AUSTRALIA have formed a new jointly owned company which will initially manufacture fluorocarbons at Monsanto's present Sydney plant by about mid-1961.

PETROLEUM CHEMICAL CORP. (AUSTRALIA) LTD. Matraville, New South Wales, Australia. Plant manager: R. H. Mashford. Plant now being built, with completion target mid-1961, to produce 2.5 million Imp. gal/yr of benzene, 1 million Imp. gal/yr of toluene, 500,000 Imp. gal/yr of xylene, and 20 million lb/yr of monostyrene. The latter will actually be produced by Australian Petrochemicals Ltd (see separate listing).

SHELL CHEMICAL (AUSTRALIA) LTD. Clyde, Australia, will complete by 1962 a new 25,000 ton/yr, $22.4 million ethylene plant. A new $2.25 million 1,000 ton/yr epoxy resins plant was completed in 1960.

SHELL CHEMICAL (AUSTRALIA) LTD. Geelong, Australia.
Product: sulfuric acid, 100 metric ton/day; detergent alkylate, 7,000 ton/yr.

SWIFT & BORDEN CHEMICAL CO. LTD. expects to complete early in 1962 a $250,000, 13 million lb/yr formaldehyde plant at Sydney, Australia.

UNION CARBIDE AUSTRALIA LTD., Melbourne, Australia, is constructing a 30 million lb/yr, $20 million polyethylene plant at Altona, with completion of half the capacity scheduled for mid-1961. Contractor is George Wimpey & Co. Ltd.

UNION CARBIDE (AUSTRALIA) LTD. will start production at a new plant at Rhodes, N.S.W., Australia, of Bisphenol A (diphenylolpropane), to be supplied to the epoxy resins plant being built by Shell at Clyde.

VACUUM OIL PTY LTD., Altona, Victoria, Australia. Managing director, E. A. Jones.
Raw materials: streams from Stanvac refinery.
Products: sulfur, 40 ton/day.
A new plant costing $35 million and scheduled for completion in mid-1961, will produce 45,000 long ton/yr of ethylene, 21,000 ton/yr of butadiene, and propylene, butylene, and derivatives.

India

ALKALI & CHEMICAL CORP. (subsidiary of Imperial Chemical Industries), West Bengal, India.
Product: polyethylene, 3,500 ton/yr (an $8.4 million plant completed in 1959).

CALIFORNIA CHEMICAL CO., INTERNATIONAL MINERALS AND CHEMICAL CORP., AND E. J. D. PARRY have been given Indian government approval to build an 80,000 ton/yr, $30 million fertilizers plant at Madras, to operate on feed from the Caltex refinery at Vizagapatam, India.

INDIAN GOVERNMENT plans a new $25 million plant at an undisclosed site in India to produce naphthalene, benzene, toluene, and xylenes. Engineering and process technological assistance will be provided by Bayer, Hoechst, BASF, and Friedrich Uhde.

NATIONAL CARBON INDIA was scheduled to complete a 3,500 ton/yr polyethylene plant near Bombay this year.

NEYVELI LIGNITE plans completion in 1963 of a new $52 million, 500 ton/day urea plant at Neyveli, India. Contractors are Montecatini and Ansaldo.

PHILLIPS CARBON BLACK LTD. is building a 22 million lb/yr carbon black plant near Durgapur, India, with completion expected late in 1961 or early 1962. This is a new company (Phillips Petroleum 30%; Duncan Bros. & Co. Ltd. of Calcutta, 30%; private investors 40%).

PHILLIPS PETROLEUM CO. has made an offer to the state of Assam, India, to build a $24 million petrochemical plant near the new refinery being built at Gauhati and to operate on refinery streams. Products planned include plastics and, ultimately, synthetic rubber.

POLYCHEM LTD. (associated with Dow Chemical), Fort Bombay, India.
Product: polystyrene.

SAHU CHEMICALS, Varanasi, India, will complete the following facilities this year: ammonia, 120 ton/day; ammonium chloride, 120 ton/day.

SYNTHETICS AND CHEMICALS LTD. is planning to build India's first synthetic rubber plant, near Bareilly. The $30 million facility, with an initial capacity of 20,000 ton/yr, will produce butadiene, styrene, and copolymer. The Lummus Co. has the contract. This is a new company, formed by Firestone Tire & Rubber Co., and Kilechand Devchand & Co. Private Ltd. of Bombay.

Indonesia

INDONESIAN GOVERNMENT will complete a $30 million ammonia plant near Palembang, Sumatra, in 1962, with capacity of 330 ton/day of fertilizer grade prilled urea, and to operate on natural gas. Foster Wheeler is the contractor.
Also being constructed: $38 million, 100,000 ton/yr urea plant at same location. Morrison Knudsen of the USA will design, construct and handle startup and operator training.

Japan

ASAHI CHEMICAL INDUSTRY CO. Kawasaki.
Product: acrylonitrile, 5,000 ton/yr.

ASAHI DENKA KOGYO. Tokyo.
Raw material: propylene.
Products: propylene oxide, 3,000 ton/yr; propylene glycol, 2,000 ton/yr.

ASAHI-DOW LTD. Kawasaki.
Raw materials: ethylene, benzene.
Products: styrene, 18,000 ton/yr; polystyrene, 16,800 ton/yr.
Planned: $4 million, 3,000 ton/yr acrylonitrile for completion this summer. Styrene increase to 36,000 ton/yr by March, 1962. Polyethylene, using the AGFO process, developed by AG fuer Olefinpolymerization and licensed by Scientific Design Co.

BRIDGESTONE TIRE CO. of Tokyo plans a 10,000 ton/yr cis-polybutadiene plant. Phillips Petroleum Co.'s process will be used and Phillips will furnish process design and technical advice.

DAINIPPON KASEI plans completion in March, 1962, of a plant at Otake with the following products (ton/yr): acetic acid, 7,200; butyl acetate, 7,200; butanol, 9,600; methoxybutyl acetate, 2,400.

ELECTRO-CHEMICAL CO. plans an $80 million petrochemical plant at Goi, Japan, to be built over an eight year period, and to operate on feedstock from Maruzen Oil. Products planned include ethylene, polyethylene, chloroprene, ethylene glycol, ethylene oxide, acetaldehyde, vinyl acetate, acetic acid, methanol, toluene, styrene, phthalic anhydride, and caustic soda.

FURUKAWA CHEMICAL INDUSTRY CO. LTD. Kawasaki.
Raw material: ethylene.
Product: polyethylene, 9,000 ton/yr.
Under construction: polybutene, 2,000 ton/yr, for completion this year.

JAPAN SODA LTD. Nihongi.
Products (ton/yr): ethylene oxide, 2,400; ethylene glycol, 600; propylene oxide, 360; propylene glycol, 360.

JAPAN SYNTHETIC RUBBER CO. LTD. Yokkaichi.
Products (ton/yr): butadiene, 33,500; SBR rubber, 50,000.
Planned: carbon black, 13,000 ton/yr, by March, 1962.

JAPANESE GEON CO. LTD. (35% Goodrich, balance Furukawa group). Kawasaki.
Raw materials: butadiene and styrene.
Products (ton/yr): SBR rubber, 2,400; high styrene rubber, 3,600; NBR rubber, 2,400.
Planned: increase in total products output to 30,000 ton/yr, by 1962.

KARONITE CHEMICAL CO. LTD. (California Chemical Co. 45%, Kao Soap Co. Ltd., 45%, and Nomura Jimusho Inc. 10%) has been established to build a new plant at Kawasaki at a cost of about $2 million, for completion in 1962. It will produce 2 million gal/yr of lube oil additives and 500,000 gal/yr of alkyphenols.

KOKKAN CHEMICAL CO., Kawasaki, will complete a 13,000 ton/yr styrene unit ($2.22 million), and a 7,000 ton/yr polystyrene unit ($1.1 million) in September of this year.

KYOWA FERMENTATION INDUSTRY CO. LTD. expects to complete in the spring of 1963 a $20 million plant at Yokkaichi, to produce (ton/yr); acetaldehyde, 61,500; butanol, 25,000; ethylene, 41;300; propylene, 20,600; and octyl alcohol, 6,000.

KYOWA GAS KAGAKU KOGYO, a subsidiary of Kyowa Hakko Co. and Nippon Mining Co., plans a plant at Niigata, Japan, to produce 27 ton/day acetylene from natural gas, and 100 ton/day methanol.

MARUZEN OIL CO. LTD. Kudamatsu.
Raw materials: refinery streams.
Products (ton/yr): benzene, 6,000; toluene, 3,600; xylenes, 3,600; sec-butanol, 4,800; methyl ethyl ketone, 4,560; phthalic anhydride, 2,040; isophthalic acid, 5,000; terephthalic acid, 2,215; benzoic acid, 900.

MARUZEN OIL CO. LTD. Matsuyama.
Products (ton/yr): benzene, 6,000; toluene, 19,200; xylenes, 19,200; paraxylene, 6,200; terephthalic acid, 7,750.
Under construction: terephthalic acid increase to 15,500 ton/yr, and paraxylene to 12,400 ton/yr.

MARUZEN OIL CO. LTD. plans a $10 million plant at Goi, to produce ethylene, 44,000 ton/yr; and propylene, 22,000 ton/yr, for completion by December, 1962. Longer range plans include higher alcohols, 20,000 ton/yr; polybutylene, 5,000 ton/yr; methyl ethyl ketone, 3,000 ton/yr; and butanol, ethyl benzene, and nonene.

MARUZEN OIL CO. LTD. and DOW INTERNATIONAL plan a $44 million, 10,000 ton/yr phenol plant as a joint venture at Matsuyama, Japan, using a toluol process.

MIIKE GOSEI CHEMICAL INDUSTRY LTD. plans an 8 million lb/yr maleic anhydride plant at Ohmuta, Kyushu, Japan, using Scientific Design Co.'s licensed process.

MITSUBISHI KASEI. Yokkaichi.
Products: isobutanol, 1,680 ton/yr; ethyl hexanol, 6,000 ton/yr.
Planned: acrylonitrile, 7,200 ton/yr, by mid 1962.

MITSUBISHI MONSANTO CHEMICAL CO. Yokkaichi.
Product: polystyrene, 14,400 ton/yr; styrene acryl copolymer, 3,500 ton/yr.

MITSUBISHI OIL CO. Kawasaki.
Raw material: reformate.
Products (ton/yr): benzene, 4,440; toluene, 9,360; xylenes, 7,800.

MITSUBISHI PETROCHEMICAL CO. LTD. Yokkaichi.
Products (ton/yr): ethylene, 44,000; propylene, 40,000; polyethylene, 25,000; styrene, 33,000; ethylene oxide, 4,700; ethylene glycol, 3,000; benzene, 13,000; toluene, 14,000; xylenes, 11,000.
Under construction: ethylene expansion by 38,000 ton/yr, propylene by 25,000 ton/yr, and polyethylene by 25,000 ton/yr.

MITSUBISHI PETROCHEMICAL plans to complete late this year 10,000 ton/yr polypropylene at Kawajiri, and 4,000 ton/yr of epoxy resin capacity by January 1962.

MITSUBISHI VONNEL CO. LTD. (owned jointly by Mitsubishi and Chemstrand Corp.) Hiroshima, Japan.
Product: acrylic fibers.

MITSUI KAGAKU. Nagoya.
Product: propylene glycol, 1,200 ton/yr.

MITSUI KAGAKU plans a 10,000 ton/yr polypropylene plant at Otake, for completion December, 1962.

MITSUI PETROCHEMICAL INDUSTRY LTD. Iwakuni plant, Wakimura.
Products (ton/yr): ethylene, 20,000; propylene, 13,000; polyethylene, 12,000; ethylene glycol, 9,600; ethylene oxide, 12,000; phenol, 12,000; acetone, 7,000; terephthalic acid, 14,400; benzene, 12,000; toluene, 14,400; xylene, 12,000; paraxylene, 5,000.

MITSUI PETROCHEMICAL INDUSTRY LTD. plans a new facility at Otake with following outputs (ton/yr): ethylene, 20,000; propylene, 40,000 (both by December 1962); and acetaldehyde, 24,000 (by mid 1962).

MITSUI POLYCHEMICAL LTD. (half Mitsui Petrochemical and half du Pont) plans a polyethylene plant of 24,500 ton/yr at Otake, Japan, by 1962.

NIPPON CATALYTIC CHEMICAL LTD. Fukita.
Product: phthalic anhydride, 46,000 ton/yr.

NIPPON CATALYTIC CHEMICAL LTD. Kawasaki.
Products: ethylene oxide, 10,800 ton/yr: ethylene glycols, 7,200 ton/yr.

NIPPON OIL CO. LTD. Shiohama.
Products: isopropanol, 10,000 ton/yr; acetone, 10,500 ton/yr.

NIPPON PETROCHEMICALS CO. LTD. Chidori-cho.
Products (ton/yr): ethylene, 40,000; butadiene, 6,000; isopropanol, 4,000; acetone, 4,500; isopropyl ether, 500; propylene, 35,000.
Under construction, completion by December (ton/yr): benzene, 16,300; toluene, 9,100; xylene, 3,800.
Planned, capacity increases by mid-1962 (ton/yr): ethylene to 50,000; propylene to 43,000.

NIPPON PETROLEUM DETERGENT CO. LTD., 55% Nippon Petrochemical Co. Ltd. and 45% Oronite Chemicals Co., will complete late this year a $4.2 million, 15,000 ton/yr detergent polymer and alkylate plant at Kawasaki, Japan, near Tokyo.

NIPPON YUSHI. Amagasaki.
Product: polyethylene glycol, 600 ton/ yr.

NISSEKI SENZAI. Chidori-cho.
Products: alkyl benzol, 15,000 ton/yr: nonane, 1,000 ton/yr.

NITTO CHEMICAL CO. Shin-maru Bldg., 1-4, Marunouchi, Chiyoda-ku, Tokyo, Japan, (representative, Takesada Akiba), plans a 20,000 ton/yr polyethylene plant at a cost of $9.44 million, and a 6,000 ton/yr ethylene glycol unit at $280,000. Completion is expected this year.

NITTO KAGAKU expects to complete by mid-1962 a plant at Kawasaki to produce 7,200 ton/yr of acrylonitrile.

NITTO UNICAR CO. LTD., owned 50-50 by Nitto Chemical Co. and Union Carbide Co., plans a 27,000 ton/yr polyethylene plant at Kawasaki, Japan, for completion in 1962, to operate on ethylene feed from Toa Nenryo.

SHIN NIPPON CHISSO HIRYO K.K. plans a plant at Goi, Chiba Pref. Japan, with the following products: (in tons/yr): acetaldehyde, 30,000; acetic acid, 10,000; ethyl acetate, 6,000; octyl alcohol, 10,000; decyl alcohol, 6,000; polypropylene, 11,000. Avisun Corp. will provide technical assistance in the polypropylene plant, to be completed early in 1962.

SHOWA DENKO K.K. Kawasaki, Japan.
Products: propylene glycol, 3,600 ton/yr; and propylene oxide, 3,600 ton/yr.
Construction: polypropylene, 10,000 ton/yr; vinyl chloride, 22,000; phthalic anhydride, 3,600; acetaldehyde, 24,000; oxo alcohol, 6,000; carbon black, 5,000 (using Phillips licensed process and to be completed by 1962).

SHOWA NEOPRENE K.K. has been formed by Showa Denko K.K. and duPont, to build and operate an 8,000 ton/yr, $9.75 million neoprene plant at Kawasaki, Japan.

SHOWA PETROCHEMICAL CO. Kawasaki.
Product: polyethylene, 10,000 ton/yr.
Planned: increase to 20,000 ton/yr, by 1962.

SUMITOMO CHEMICAL CO. LTD. Niihama.
Products (ton/yr): ethylene, 16,500; acetylene, 8,250.

SUMITOMO CHEMICAL CO. LTD. Oe.
Products (ton/yr): ethylene, 12,000; propylene, 8,000; polyethylene, 11,000.
Planned (ton/yr): for this October, polyethylene, 15,000 at cost of $8 million; By mid-1962, ethylene, 26,500; propylene, 23,000; polyethylene, 24,000. By early 1963, polypropylene, 10,000.
Long range plans: (1962 through 1965): oxo alcohol, 10,000; propylene glycol, 4,000; acrylonitrile, 10,000.

TOA NENRYO KOGYO K.K., an affiliate of Stanvac, plans to complete a new $27 million petrochemical complex by 1962-1963 at Kawasaki, Japan, with the following products (in ton/yr): ethylene, 62,000; propylene, 50,400; butadiene, 11,300; butanol, 3,400; iso-butanol, 2,900; octyl alcohol, 10,000; and polypropylene, 10,000.

TOYO KOATSU. 8, Sanko-cho, Omuda City, Fukuoka Pref., Japan. Manager: Masayoshi Naito.
Company plans 25,000 ton/yr, $12.5 million polyethylene plant.

YAWATA CHEMICAL CO., formed recently by Shin Nippon Chisso K.K. (70%) and Kyushu Chemical Co., expects to complete by April, 1962, a plant at Tobata, Japan, to produce 100,000 ton/yr of ammonium sulfate and 24,000 ton/yr of vinyl chloride.

Korea (South)

KOREAN GOVERNMENT, Chung Ju, Korea.
Product: urea, 285 ton/day.

Malaya

STANDARD-VACUUM OIL CO. LTD. will build a chemical fertilizer facility as part of a planned $30 million refining-petrochemical installation in Malaya. Wah Chang Corp., New York, will design and construct the plant.

Pakistan

BURMAH OIL CO. and **CONSTOCK INTERNATIONAL METHANE, LTD.** are discussing possible carbon black plant in West Pakistan to operate on gas from the Sui field. New company, Sui Carbon Co. Ltd. will be formed. Plan calls for a $5 million 300,000 ton/yr plant.

MANZOOR CHEMICALS CO. and **GENERAL INDUSTRIES LTD.** plan a 5,000 ton/yr polyethylene plant (high pressure process), at an undisclosed site in Pakistan. A German group has the contract: Salzgitter Industriebau GmbH and Braunschweigische Maschinenanstalt.

PAKISTAN INDUSTRIAL DEVELOPMENT CORP. Fenchuganj, East Pakistan, will complete a $20 million synthetic fertilizer plant in November, 1961, to operate on Sylhet field gas. Expected production of urea will be 136,000 ton/yr; ammonia, 82,000 ton/yr; ammonium sulfate, 250,000 ton/yr.

PAKISTAN INDUSTRIAL DEVELOPMENT CORP., Multan, West Pakistan, will complete a fertilizer plant operating on Sui fields gas, producing 103,000 ton/yr of ammonium nitrate and 59,200 ton/yr of urea.

Taiwan

CHINESE PETROLEUM CORP. Chia-yee, Taiwan. Superintendent, Paul Hao.
Raw material: naphthas.
Products: solvents.

CHINESE PETROLEUM CORP. Kaohsiung, Taiwan. Manager, J. N. Hu.
Raw materials: refinery and natural gas, naphtha.
Products: aromatics, sulfur (15 ton/day), carbon black.

CHINESE PETROLEUM CORP. and **MOBIL CHEMICAL CO.** have submitted a joint application to the government of the Republic of China for the construction of a 100,000 ton/yr urea plant at an undisclosed site in Taiwan.

USSR and Bloc

Bulgaria

BURGAS PETROCHEMICAL WORKS (government) will be built at the Burgas refinery. Products planned: polyethylene, ethanol, phenol.

Czechoslovakia

J. V. STALIN FUEL WORKS, Zaluzi, plans an increase in products from petroleum, including these: sulfur, methanol, phenol, toluene, xylene, ammonia, oxygen.

SLOVNAFT PETROCHEMICAL WORKS (government), Podunajske Biskupice, near Bratislava, will complete units to produce polyethylene, synthetic rubber, and detergents in 1965.

Germany (East)

SCHWEDT PETROCHEMICAL WORKS (government), plans for completion at Schwedt in 1965, new facilities to produce ethylene, propylene, polyethylene, phenol, and caprolactam. A $12 million, 40,000 ton/yr ethylene plant has been ordered from a British group comprising Humphreys and Glasgow Ltd. and Petrocarbon Developments Ltd.

Hungary

HUNGARIAN GOVERNMENT petrochemical plants have a number of expansion projects under way.
(1) Tiszapalkonya will add 100,000 ton/yr to capacity for nitrogenous fertilizers.
(2) Kazincbarcika will double fertilizer output and convert from coke to natural gas as feedstock.
(3) Borsod Chemical Combine will build a 15,000 ton/yr polyvinyl chloride plant.
(4) Tiszavidek will build a 100,000 ton/yr polyethylene plant.

Poland

POLISH GOVERNMENT. Plock, Poland, plans a petrochemical plant as part of a new refinery expected to be completed in 1965. Plant is to operate on natural gas and refinery streams. Products planned: phenol, acetone, ethylene, propylene, polystyrene (35,000 lb/day), synthetic rubber (60,000 ton/yr).

POLISH GOVERNMENT, Tarnow, Poland.
Raw material: natural gas.
Products: methanol, chloroform, carbon tetrachloride, monochloromethane, acetone, caprolactam, formalin, and other products.

Romania

BORZESTI CHEMICAL COMBINAT (government) is building a plant at Borzesti. Plans call for: polyethylene, polypropylene, aromatics.

J. V. STALIN CHEMICAL WORKS (government) Victoria, Romania.
Products: fertilizers.
Construction: formaldehyde, 24,000 ton/yr.

MASCHINIMPORT, Bucharest, the Romanian state enterprise, has ordered a $2.25 million polystyrene plant from Petrocarbon Developments Ltd. of the UK. Location and size of plant has not been disclosed.

ONESTI CHEMICAL WORKS (government), Onesti, Romania.
Products: acetone, 5,500 ton/yr; phenol, 9,000 ton/yr; butadiene-styrene rubber, 25,000 ton/yr.
Planned: doubling of current output.

ROMANIAN GOVERNMENT. Fagaras, Romania.
Raw material: natural gas.
Product: ammonium nitrate, 30,000 ton/yr.

ROMANIAN GOVERNMENT. Roznov, Romania.
Product: ammonium nitrate, 62,000 ton/yr.
Planned: expansion by early 1963, to 80,000 ton/yr.

USSR

UNION OF SOVIET SOCIALIST REPUBLICS (USSR) plans to triple overall chemical output in a $20 to $25 billion program that started in 1959.
Highlights of program: 140 new plants; 130 modernization projects; synthetic fibers up 12 to 13 fold; plastics and resins up 7 times; synthetic rubber nearly tripled, with polyisobutylene about 25% of the total and an estimated 200,000 ton/yr.
Among individual projects reported:
(1) A $1.8 million, 9,000 ton/yr polystyrene plant ordered from P.G. Engineering Ltd.
(2) A 24,000 ton/yr polyethylene plant from Berg and Huttenbetriebe of West Germany.
(3) A 70,000 ton/yr synthetic rubber finishing plant from John Dalglish & Sons Ltd., a Scottish firm.
(4) Three urea plants ordered from Werkspoor of the Netherlands.

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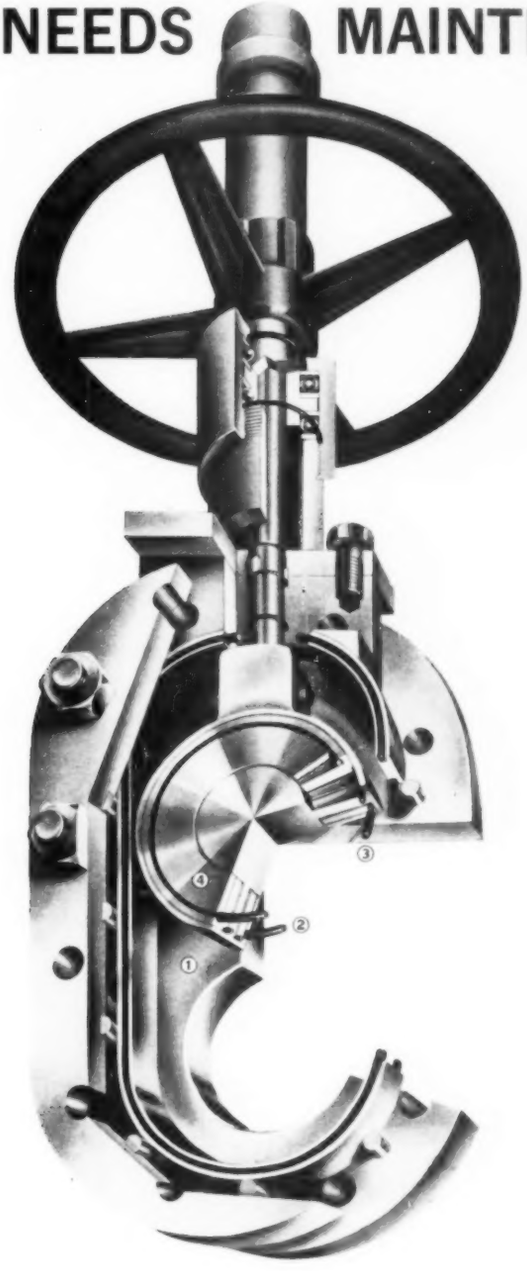

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World Petroleum Statistics

FREE WORLD SUPPLY AND DEMAND, CRUDE AND PRODUCTS, NOVEMBER 1960

(Thousands of barrels)

Source: USA Bureau of Mines, Division of Petroleum

Country	CRUDE PETROLEUM					REFINED PRODUCTS			
	Production	Imports	Exports and reexports	Stock change, other demand, and loss	Total 1/ refinery output / Total 2/ refinery output	Imports	Exports and reexports	Domestic demand (incl. bunkers) 3/	Bunkers-all flags (as reported)
NORTH AMERICA									
Canada	15,013	11,458	2,642	+140	23,934	4,489	169	4/28,498	5/347
Mexico	8,029		103	-545	8,991	407	348	9,050	
United States (incl. Alaska and Hawaii)	213,992	29,980		+7,183	251,601	26,664	5,164	4/299,669	5,987
Subtotal	237,027	41,438	2,745	+6,778	284,526	31,500	5,681	337,217	
CENTRAL AMERICA AND CARIBBEAN									
Costa Rica	-	-	-	-	-	6/ 87	-	87	
Cuba	6	5/1,850	-	-	5/1,856	6/188	-	2,044	
Dominican Republic	-	-	-	-	-	6/259	-	259	
El Salvador	-	-	-	-	-	6/122	-	122	
Guatemala	-	-	-	-	-	6/274	-	274	
Haiti	-	-	-	-	-	6/ 37	-	37	
Honduras	-	-	-	-	-	6/125	-	125	
Jamaica	-	-	-	-	-	598	-	598	5/100
Nicaragua	-	-	-	-	-	6/105	-	105	
Panama, Canal Zone	-	-	-	-	-	674	156	518	366
Panama, Republic	-	-	-	-	-	6/254	-	254	
Puerto Rico	-	2,287	-	-165	2,767	540	1,525	1,782	
Subtotal	6	4,137	-	-165	4,623	3,263	1,681	6,205	
SOUTH AMERICA									
Argentina	6,747	1,117	-	+735	7,129	579	-	4/7,193	141
Bolivia	265	-	83	-38	220	9	5	224	
Brazil	2,744	2,644	-	-1,007	6,395	6/2,997	-	9,392	
British Guiana	-	-	-	-	-	183	-	183	
Chile	600	170	-	-187	6/957	6/266	-	1,223	
Colombia	4,778	-	2,833	-239	2,306	6/ 56	6/255	2,103	5/100
Ecuador	223	258	-	+36	445	19	2	464	
Netherlands Antilles	-	19,370	-	-873	22,710	1,457	18,697	4/5,470	5/1,884
Paraguay	-	-	-	-	-	6/ 68	-	68	
Peru	1,613	-	240	+83	1,304	363	200	1,467	16
Trinidad	3,681	4,539	249	-147	8,160	5	5,710	4/2,455	1,116
Uruguay	-	610	-	-88	698	41	-	739	5/152
Venezuela	82,009	-	53,081	-98	29,271	6/ 12	26,204	4/4,835	1,484
Subtotal	102,660	28,708	56,486	-1,823	79,591	6,055	51,073	36,016	
WESTERN EUROPE									
Austria	1,365	263	571	+84	1,001	799	108	4/1,970	
Belgium and Luxembourg	-	4,482	-	+67	4,416	1,951	1,579	4,788	445
Denmark	-	-	-	-25	6/ 25	2,088	15	2,098	113
Finland	-	370	-	-280	6/650	1,228	1	1,871	
France	1,186	21,588	-	+1,319	21,471	1,259	4,593	4/17,901	994
Germany, West	3,406	15,476	-	-281	19,103	4,207	2,852	20,658	443
Greece	-	1,411	-	+386	1,025	151	-	1,176	
Iceland	-	-	-	-	-	365	-	365	
Ireland	-	627	-	-259	886	177	59	1,004	
Italy	1,368	19,661	265	+1,151	20,131	1,889	4,408	4/14,446	1,394
Netherlands	1,152	9,477	-	-1,012	12,449	2,569	8,096	6,302	288
Norway	-	564	-	+364	6/200	1,954	-	2,154	6/183
Portugal	-	684	-	-265	949	317	11	1,255	6/225
Spain	-	2,594	-	+293	2,468	309	250	2,527	6/598
Sweden	-	2,155	-	+457	6/1,698	7,151	52	8,797	6/247
Switzerland	-	-	-	-	-	2,074	2	2,072	
United Kingdom	58	31,192	-	+1,003	28,247	10,732	7,736	4/31,590	2,579
Yugoslavia	750	6/100	-	-	850	6/150	6/ 49	951	
Subtotal	9,285	110,624	856	+4,992	115,569	39,538	29,611	128,699	
MIDDLE EAST									
Aden	-	3,907	-	+139	3,788	710	1,753	2,745	2,361
Bahrain	1,353	5,474	-	+76	6,809	83	5,737	1,135	988
Iran	35,625	-	22,287	+896	12,442	-	7,833	4,609	6/551
Iraq	29,663	-	6/26,531	-	6/1,132	6/ 1	-	1,133	
Israel	81	6/794	-	-	875	6/698	37	1,736	6/ 30
Jordan	-	-	-	-	-	6/118	-	118	
Kuwait	49,477	-	46,044	-1,709	5,142	6/ 1	2,883	2,260	1,621
Lebanon	-	441	-	-	441	6/ 33	-	474	6/ 67
Neutral Zone	4,477	-	6/4,000	-473	6/950	-	6/400	550	6/ 300
Qatar	4,816	-	6/4,798	-	6/ 18	-	-	18	
Saudi Arabia	19,763	-	33,139	-1,010	7,584	5	4,948	2,179	6/1,060
Turkey	321	-	-	-13	234	615	-	849	
U.A.R., Syria	-	6/468	-	-	6/468	6/ 99	-	567	
Subtotal	145,476	11,104	138,849	-2,094	39,883	2,563	23,611	18,373	
AFRICA									
Algeria (French Sahara)	8,886	-	9,115	-229	-	6/797	-	797	
Angola	41	-	-	-97	128	46	33	141	
Republic of the Congo	-	-	-	-	-	6/188	-	188	
Canary Islands	-	2,175	-	+216	2,570	1	1,619	952	403
Ethiopia	-	-	-	-	-	6/ 57	-	57	
States formerly in French Equatorial Africa	530	-	280	+310	-	6/178	-	178	
States formerly in French West Africa	-	-	-	-	-	6/1,001	-	1,001	6/660
Ghana	-	-	-	-	-	6/246	-	246	
Kenya	-	-	-	-	-	6/377	73	302	6/ 76
Liberia	-	-	-	-	-	6/ 32	-	32	6/ 1
Malagasy Republic	-	-	-	-	-	100	-	110	
Morocco	52	6/136	-	-	178	345	-	5/535	
Nigeria	552	-	476	+76	-	6/532	-	532	
Federation of Rhodesia and Nyasaland	-	-	-	-	-	6/329	-	329	
Sierra Leone	-	-	-	-	-	6/231	-	231	6/127
The Sudan	-	-	-	-	-	6/249	-	249	
Tanganyika	-	-	-	-	-	6/454	25	429	
Tunisia	-	-	-	-	-	233	-	5/295	
Uganda	-	-	-	-	-	6/ 96	22	74	
Union of South Africa	-	767	-	-48	815	1,550	94	2,271	6/110
U.A.R., Egypt	2,034	6/1,248	193	+249	6/2,834	6/624	6/123	3,335	6/185
Subtotal	12,095	4,310	10,004	+487	6,525	7,676	1,991	12,284	
SOUTH ASIA, FAR EAST, AND OCEANIA									
Australia	-	8,203	-	+1,258	7,546	1,005	1,470	5/6,975	6/632
British Borneo	2,697	-	1,341	-	6/1,356	81	1,243	194	79
Burma	352	-	-	+25	327	16	6/ 10	333	
Ceylon	-	-	-	-	-	461	1	460	218
India	255	6/1,369	-	-	6/1,584	1,003	203	4,624	6/230
Indonesia	12,740	6/959	6,997	+271	6/7,080	6/ 371	6/6,198	1,253	6/197
Japan	359	20,089	-	+1,274	19,711	1,617	311	23,017	6/1,265
Korea, South	-	-	-	-	-	6/505	-	505	
Malaya and Singapore	-	673	310	+363	-	6/4,916	6/790	4,026	1,193
Netherlands New Guinea	111	-	6/111	-	-	Insig.	-	Insig.	
New Caledonia	-	-	-	-	-	6/ 34	-	34	
New Zealand	-	-	-	-	-	6/631	-	631	6/130
Pakistan	177	-	-	-25	202	6/960	6/ 21	1,121	
Philippines	-	1,006	-	+92	914	6/859	-	1,773	6/ 11
Taiwan	1	687	-	-10	698	12	35	675	
Thailand	-	-	-	-	-	6/743	-	743	6/ 8
Vietnam, South (incl. Cambodia)	-	-	-	-	-	6/461	-	461	6/ 3
Subtotal	16,692	35,196	8,759	+3,248	41,658	15,655	10,382	46,825	
WORLD TOTAL EXCLUDING EASTERN EUROPE, U.S.S.R., & MAINLAND CHINA	543,241	235,517	217,699	+11,423	572,375	106,250	124,028	579,619	

1/ Estimate based on latest available data.
2/ Total input includes crude runs to stills plus runs of other unfinished oils, topped crude and natural gas liquids blended.
3/ Total output includes refined product output plus refinery fuel and loss; excludes liquefied petroleum gases sold directly for fuel and chemical uses from natural gasoline plants.
4/ Unless otherwise specified, data represent apparent domestic demand (including inland demand, refinery fuel and loss, and bunkers). Apparent domestic demand is derived from the components of refined product output, plus imports, minus exports, with no allowance for changes in stocks.
5/ Domestic demand as reported, including refinery fuel and loss, stock changes, and bunkers; also includes, where available, liquefied petroleum gases sold directly for fuel and chemical uses from natural gasoline plants.
6/ Apparent domestic demand is heavily influenced by refinery fuel and loss, and bunker loadings.

World Refining Will Increase to 31% by 1965

(Continued from page 40)

chemical plants in the non-Communist world, which is an increase of 45 plants since 1960, or about 7.7%. New projects now planned, or under construction, amount to 363.

Total indicated investment for the reported projects comes to approximately 4.25 billion. However, based on current construction costs as well as the long range plans which have been reported in several of the larger nations—notably the U.K., Japan, France, Italy, and Germany—it is reasonable to predict a total free world expenditure of around $5.7 billion during the coming few years. END

TABLE 3—Current World Petrochemicals Plant Construction

Country	Operating Plants	Number of new projects	Investment* $ millions
Canada	40	22	96.3(13)
Mexico	6	5	n.a.
USA	400	118	1842.0
No. America	446	145	1938.3
Argentina	2	15	174.0(6)
Bolivia	0	1	n.a.
Brazil	13	6	60.0(1)
Chile	1	0	0
Colombia	1	3	13.0(1)
Costa Rica	0	1	10.0
Neth. Ant.	0	1	96.0
Peru	1	1	10.0
Puerto Rico	0	2	20.0(1)
El Salvador	0	1	6.0
Trinidad	1	0	0
Uruguay	0	1	n.a.
Venezuela	0	2	2.0(1)
So. America	19	14	337.0(14)
West. Hemi.	465	159	2275.3
Austria	1	2	n.a.
Belgium	1	1	2.0(1)
Denmark	0	1	n.a.
France	49	12	12.0(1)
Germany, FW	21	15	142.0(3)
Greece	0	2	1.0(1)
Italy	25	15	98.0(2)
Netherlands	5	14	303.0(5)
Portugal	4	2	n.a.
Spain	2	8	171.0(5)
Sweden	0	1	40.0
Switzerland	1	0	0
United King.	29	23	171.0(10)
Yugoslavia	0	3	48.6(3)
West. Europe	127	110	1198.6(32)
Algeria	0	4	n.a.
Iran	0	2	n.a.
Iraq	0	1	n.a.
Israel	0	1	14.0
Kuwait	0	1	45.0
Lebanon	0	1	n.a.
Morocco	0	1	50.0
Rhodesia	0	1	27.0
So. Africa	2	2	n.a.
Australia	5	11	120.7(8)
India	2	8	161.0(5)
Indonesia	0	1	68.0
Japan	25	34	234.5(13)
Korea (S.)	1	0	0
Malaya	0	1	30.0
Pakistan	0	4	25.0(2)
Taiwan	2	1	n.a.
Africa, M.E. Asia, Far East	37	74	775.2(34)
East. Hemi.	164	184	1973.8(66)
World	629	343	4249.1**

*Planned expenditures shown are based only on announced projects. Numbers in parentheses indicate number of projects on which such information was given. **World total shown based only on announced projects listed. Actual total is estimated at about $5.7 billion.

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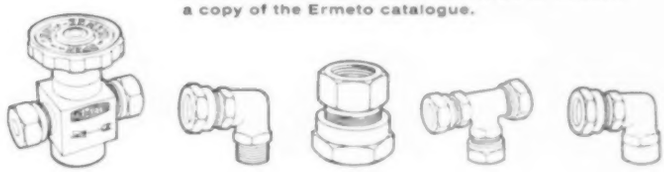

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How to Revamp a Cracking Unit

(Continued from page 62)

have to be done, they could rearrange the sequence of their work quickly whenever necessary to save time and costs.

Work assignments were constantly checked and coordinated to reduce or eliminate interference among groups in the same area. This was a must with the number of men involved; Canadian Kellogg totalled almost 30,000 man-hours and British American 15,000 to 18,000 man-hours during Phase IV. As an example of coordination, British American worked on the catalytic cracking unit during the day—replacing the entire lining in the reactor—and Kellogg worked at night on the cyclones in the same area.

A special scaffolding on the upper part of the reactor, about 30 ft above the bottom, kept the area at the bottom clear for the lining work while the cyclones and plenum chamber were replaced from above. As a result, B-A personnel were able to work on the reactor eight days before they had expected to.

One helpful technique used to clarify operations during Phase IV was as follows. Contractor's piping engineers went over the entire unit near the end of Phase III and marked with orange paint each line which was to be removed, relocated, or cut into. They also painted the Kellogg drawing number and the isometric number of the pipe. Thus B-A workmen could look up on their work orders what was to be done to the line marked, and make sure that these lines were prepared for Kellogg to work on during off-shift periods for B-A personnel.

Another time-saving technique was that the contractor performed about half the engineering work in the field. Some actual flowsheet decisions were made right at the site. For an example: an existing drum was raised three feet to give the increased net positive suction head to the pumps necessary to meet the increased capacity. A costly alternative—installing a new pump and additional piping—was thus eliminated.

Rapid procurement and expediting of deliveries was shown to be particularly important in keeping costs within limits. As an example, the new towers were to be raised during Phase II, with the unit off-stream but still under pressure. Expediting brought the towers to the jobsite a full month ahead of schedule and permitted the project to move into Phase II a week ahead of the original planned schedule time. There was actually an emergency unit shutdown because of a power failure, and B-A asked Kellogg if the schedule could be moved up. This was done, and inside of 24 hours Phase II operations were under way, because the towers, platforms, etc., were available as well as an 80-ton crane, and other equipment necessary to handle the erection. As a result, the entire phase moved a week ahead.

Safety was of prime concern throughout the project. In revamp work, and particularly in the gas recovery area of a catalytic cracking unit, there are hazards from gases and vapors such as butane and propane. Some of the safety precautions observed were these:

(1) The fresh feed drum was drained every half hour of volatile and gaseous vapors. It was protected by a steam blanket—a tarpaulin was wrapped around the drum and flow from steam hoses was directed against the tarp.

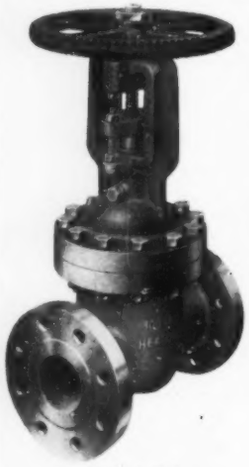
(2) British American had a full-time safety engineer on the job whose responsibility was the approval of "hot work" on an hour-by-hour basis.

(3) Canadian Kellogg "cold cut" and "cold-drilled" every pipe they had to cut into, even water and steam lines. Cold-cutting was done on small lines using a non-sparking pipe cutter. Cold-drilling was used on larger lines. First a small hole was drilled, and then a gas detection instrument probe was inserted into the line to check the explosive or flammable nature of the vapors inside.

(4) The wind direction was always checked before welds were made in sensitive areas.

(5) Fire fighting equipment — steam hoses, extinguishers, etc.—were kept constantly close at hand.

Market conditions have not yet made it necessary for British American to make the modifications required in the second stage of the capacity increase program. However, whenever the need arises, they are geared to handle it. END



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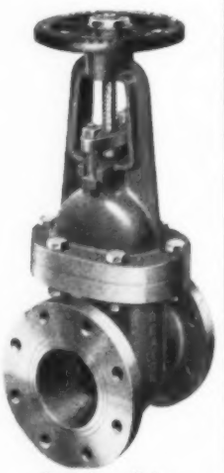

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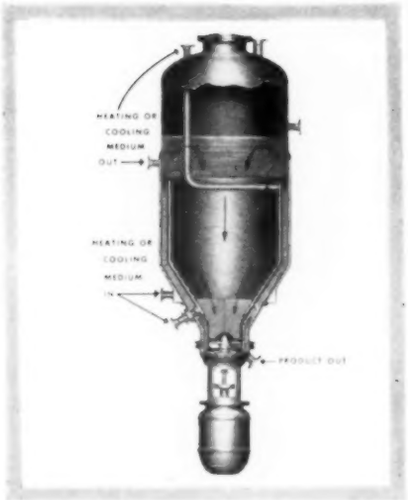

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UK Process projects

(*Continued from page 43*)

Petroleum to build a £4 million plant adjoining Esso's Milford Haven refinery, to produce 150,000 ton/yr of ammonia based on refinery gas. Esso will act as plant manager and operator.

The ammonia will be piped to another plant, this to be wholly owned by Fisons, building on a separate 40-acre site a short-distance from the refinery to produce a range of nitrogen products.

Fison's association with the production of the ammonia provides the second example in this review of vertical integration in the petrochemical field: the first was ICI's entry into crude oil distillation. At its Stanford-le-Hope (Essex) nitrogen plant, Fisons purchases some 60,000 ton/yr of ammonia made at the nearby Shell refinery.

This project also represents the first success in Esso's aim from the start to attract chemical firms to base their manufacturing on Milford Haven products.

These plants represent two of a three-part project announced by Fisons in April. The third concerns Nitrogen Fertilizers Ltd., an associated company, which will double the overall ammonia production capacity at its Flisborough (Lincolnshire) nitrogen works. This will be based on hydrocarbon gases from steel mills at Scunthorpe a few miles away. All three plants are due in operation in 1964 and Fisons share of the cost is estimated at £12 million.

Baglan Bay—Much has become known in recent months as to initial plans for the second of the centers for chemicals from petroleum—in South Wales, a few miles from British Petroleum's Llandarcy refinery.

British Hydrocarbon Chemicals (50% each British Petroleum and Distillers) has started work on a plan generally similar to its Grangemouth plant complex and with initial investment of £10 million.

Llandarcy light distillate will be processed in a steam cracker, primarily for producing olefins, which is due for completion late 1962; other products are in the planning stage. Part of the ethylene will go to another BHC plant, building for ethylene dichloride production for sale to polyvinyl chloride manufacturers; the butadiene will be sold for the production of synthetic rubber and other copolymers; but no outlet has been announced for propylene.

It is suggested the ethylene dichloride will be taken by British Geon Ltd. (55% Distillers and 45% B.F. Goodrich Co.), whose nearby plant at Barry is being further expanded from 30,000 tons by what is generally reported to be some 50%.

Forth Chemicals Ltd. (66-2/3% BHC and 33-1/3% Monsanto Chemicals) is also to build a plant at Baglan Bay, a 50,000 ton/yr styrene plant, based on ethylene from the above BHC unit. This will cost over £3 million and should be on stream late 1962.

Synthetic Rubber—According to the International Rubber Study Group, UK production of synthetic rubber has risen as follows (in long tons): 1957—750; 1958—11,300; 1959—56,990; and 1960—90,015. The 1963 figure may well be more than treble that of 1959.

International Synthetic Rubber Co. raised the capacity of its Hythe (Hampshire) plant for styrene/butadiene rubber to 90,000 ton/yr by the end of last year, and it is reported a further increase is planned. At the same time, the 3,500 ton/yr plant for high solids latex is being doubled.

Esso Petroleum is building a 30,000 ton/yr butyl rubber plant, costing £4-1/3 million at Fawley, due for completion by end-1962.

Good progress is reported by Sto-Chem Ltd. (Witco Chemical Co., and United States Rubber Co.) in the £1 million, 8 million lb/yr plant for synthetic rubber latices at Stoke Prior (Worcestershire). Production is expected next December.

A new company being formed by Revertex Ltd. and International Latex Corp. will manufacture latex. Capacity was not announced but a 60-acre site has been acquired near Grimsby (Lincolnshire).

BP - California Ltd.—Another plant due for opening this year is that of BP - California Ltd., a new company representing the first formal link-up between British Petroleum and California Chemical S.A. (Standard Oil of California) for the production of aromatic hydrocarbons. At BP's Kent refinery, it will have an annual capacity of 22,000 tons paraxylene, 19,000 tons orthoxylene and 16,000 tons of ethylbenzene.

Standard of California, through Oronite Chemical Co. holds a 33-1/3% interest in Grange Chemicals Ltd. (the balance is held by British Hydrocarbon Chemicals), and Grange plans a 15,000 ton/yr plant to make phthalic anhydride from orthoxylene instead of from naphthalene as previously. Plant location was not announced.

Monsanto Chemicals Ltd.—Will expand its Fawley polyethylene plant approximately 50% (from present 17,000 ton/yr) with the first stage operational 1963. At Newport, a new 31 million lb/yr plant came on stream towards the end of 1960 for producing maleic anhydride, and polystyrene capacity was expanded for special grades of plastics.

Imperial Chemical Industries Ltd. has a £6 million project to modernize a large section of the Billingham Works. This will incorporate a new ICI process based on light oil instead of coke for the manufacture of hydrogen for making ammonia, nitrogen fertilizers and other Billingham Division products. The new hydrogen plant is due in production in 1963.

At the Wilton Works many recent capacity increases have resulted from modifications of existing plant, involving relatively little capital expenditure but giving very substantial output gains.

Wilton is also building a plant to produce 10,000 ton/yr of maleic anhydride, based on the air oxidation of butenes.

Apart from the new outlet provided this year by the opening up of the 11,000 ton/yr "Propathene" (polypropylene) plant, now being raised to 22,000 tons, increased olefinic products are being passed to Billingham for acetone manufacture and also by carbonylation of propylene, for normal

(*Continued on page 110*)

TABLE 6—Organic Chemical Capacity by Companies

(metric ton/yr, as of February, 1961)

Acetic acid: Courtaulds (British Celanese Division)—to meet own needs. Shell Chemical—20,000.
Acetic anhydride: Courtaulds—to meet own needs.
Acetone: Courtaulds—to meet own needs. Imperial Chemical Industries—28,000, expanding to 36,000. Shell Chemical—20,000.
Acrylonitrile: ICI—expanding to 20,000.
Benzene: Courtaulds—new plant being built.
Butadiene: British Hydrocarbon Chemicals—10,000, expanding to 20,000. Esso Petroleum—42,000. ICI—14,000, being expanded.
Butadiene copolymers: ICI—10,000, being expanded.
Butadiene/styrene copolymers: Monsanto Chemicals—4,000.
Butyl rubber: Esso Petroleum—30,000 being built.
Cellulose acetate: Courtaulds—35,000.
"Courtelle" (polyacrylonitrile fiber): Courtaulds—6,000, expanding to 14,500.
Dodecyl benzene: Grange Chemicals—15,000. Monsanto—16,000. Shell Chemical—30,000.
Dodecyl benzene (straight chain): Shell Chemical—5,000, expanding to 20,000.
Ethanol: BHC—60,000. Courtaulds—to meet own needs.
Ethyl benzene: BP-California—8,000, being built.
Ethylene: BHC—130,000. Courtaulds—15,000, expanding to 20,000. Esso—40,000, expanding to more than double. ICI—120,000, expanding to 140,000. Shell Chemical—40,000, expanding to 95,000.
Ethylene dichloride: BHC—new plant being built. Courtaulds—to meet own needs.
Ethylene oxide and derivatives: Union Carbide—20,000.
Ethylene oxide and glycol: ICI—16,000, expanding to 51,000. Shell Chemical—37,000.
Ethylene, propylene and derivatives: BHC—new plant being built.
Heptenes: Esso—15,000.
Isopropanol: BHC—30,000. Courtaulds—to meet own needs. ICI—40,000. Shell Chemical—35,000.
Maleic anhydride: Monsanto—plant operating (output unknown); plant being built, 7,000.
Methanol: BHC—plant being built. ICI—50,000, expanding to 95,000.
Nylon 6: ICI—15,000, being built.
Nylon 66: ICI—22,000.
Ortho xylene: BP-California—9,500, being built.
Oxo alcohols: ICI—60,000, expanding to 140,000.
Para xylene: BP-California—11,000, being built.
Phenol: BHC—13,000. ICI—15,000, expanding to 20,000. Monsanto—10,000.
Phthalic anhydride: Monsanto—16,000.
Polydiene rubbers: Shell Chemical—plant being built.
Polyester fiber ("Terylene"): ICI—15,000, expanding to 22,000.
Polyethylene: BHC—11,000. ICI—90,000, expanding to 105,000. Monsanto—17,000, expanding to 26,000. Shell Chemical—15,000. Union Carbide—11,500, expanding to 25,000.
Polyethylene and polypropylene: Shell Chemical—15,000, being built.
Polymethyl methacrylate: ICI—20,000.
Polypropylene: ICI—11,000, expanding to 22,000.
Polystyrene: Monsanto—8,000.
Polyvinyl chloride: ICI—70,000, expanding to 80,000.
Propylene: BHC—110,000. Courtaulds—7,000, expanding to 10,000. ICI—80,000. Shell Chemical—50,000, expanding to 80,000.
Propylene oxide: Shell Chemical—12,000.
Sec-butanol: Shell Chemical—37,000.
Styrene: Forth Chemicals—80,000, expanding to 130,000. Shell Chemical—18,000.
Styrene butadiene rubber: International Synthetic Rubber—90,000, expansion reported.
Terephthalic acid: ICI—13,000, expanding to 26,000.
Tetrapropylene: BHC—20,000.
Toluene: Courtaulds—new plant being built.
Vinyl acetate: Courtaulds—3,500.
Viscose rayon: Courtaulds—200,000.
Xylene: Courtaulds—new plant being built.

Sources: as for Table 4.

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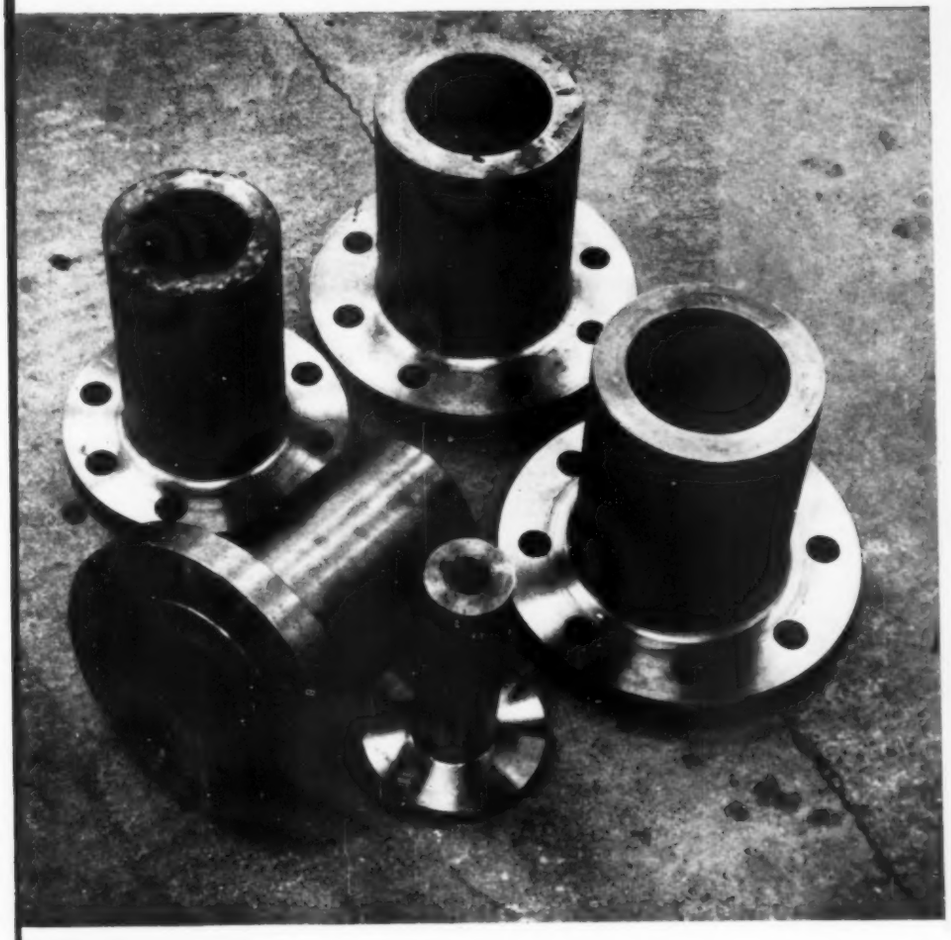

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(Continued from page 108)

butanol and isobutyl alcohol manufacture. Extensions to an existing butanols unit are in hand and the acetone plant is being expanded to 36,000 ton/yr.

In addition, a fourth plasticizer alcohols plant is to be erected at Billingham with 30,000 ton/yr capacity. Process modification is also proceeding and this, with the increased butanols output, will raise ICI's total carbonylation capacity to over 140,000 ton/yr. Alkylamine production, at present 2-3,000 ton/yr of methylamine and ethylamine, is being raised. By 1963, a new methylamine plant will be operating with five times the present capacity, while ethylamine capacity will be doubled by the end of this year. END

Italian Refining

(Continued from page 47)

ever, is in rather short supply, and it is difficult for the expanding chemical industry to get this raw material from ENI in the amounts needed.

Petrochemicals: Oil and natural gas are now by far the most important raw materials for the Italian chemical industry. From ammonia to polyolefins, almost all the major chemicals are based in Italy on petroleum raw materials.

Among recent petrochemical expansions, we give here a short note on the most important. ENI group, beside the Gela complex above quoted, has expanded its ANIC works at Ravenna. Synthetic rubber capacity has been upped to 100,000 ton/yr; and 1,4 *cis* polybutadiene (Phillips process) will be produced at Ravenna in the near future. A new plant for butane dehydrogenation is being erected and will start operation in 1961.

The Montecatini petrochemical complex at Brindisi (south Italy) is being rapidly carried forward. When completed early in 1962, it will process 2 million ton/yr crude oil, to a series of chemical products among which are ethylene-propylene elastomers. Other petrochemical activities of Montecatini in 1960 include increased polypropylene fibers and films capacity at the "Polymer" subsidiary at Terni; a new plant (Scientific Design) at the subsidiary ACNA works in Cengio for phthalic anhydride from both naphthalene and orth-xylene; and increased capacity for olefins and polymers at Ferrara.

The third big Italian petrochemical concern, "Edison" group, increased olefin capacity at Mantua from 25,000 to 35,000 ton/year. At the same works an acetone—phenol unit (via cumene) was completed late in 1960. Among the more interesting additions to "Edison" petrochemical units are: increased capacity for high pressure polyethylene at Priolo (Sicily), by the "Celene" subsidiary, from 20,000 to 30,000 ton/yr; a plant for olefin production from steam cracking of virgin naphtha (feed capacity 20,000 ton/yr) on stream at the "Sincat" works also at Priolo, where a butadiene recovery unit from olefin stream is now being erected.

Facilities for aromatic production (benzene, ethyl benzene, xylenes) are being built by Shell Italiana at the Rho refinery near Milan and by Mobil Chimica Italiana (an affiliate of Socony Mobil Oil Co.) near the Naples refinery.

A notable carbon black industry has been installed in the country during the past year. All the prominent USA carbon black manufacturers have chosen Italy as the site of their European subsidiaries. Carbon black capacity in Italy will be close to 80,000 ton/yr by the end of 1961. Previously, no carbon black at all was produced in the country, and the product for the rubber industry was imported from abroad.

A Cabot plant was completed near Ravenna early in 1961. Columbian and Continental are operating, since April 1961, a jointly-owned 22,000 ton/yr plant at Trecate, near the Sarpom refinery. Phillips has a plant being erected at Ravenna, near the ANIC works. Aromatic concentrate, the raw material for the black, is imported from the U.S.A. The Italian government has granted full import duties exemption for this material. END

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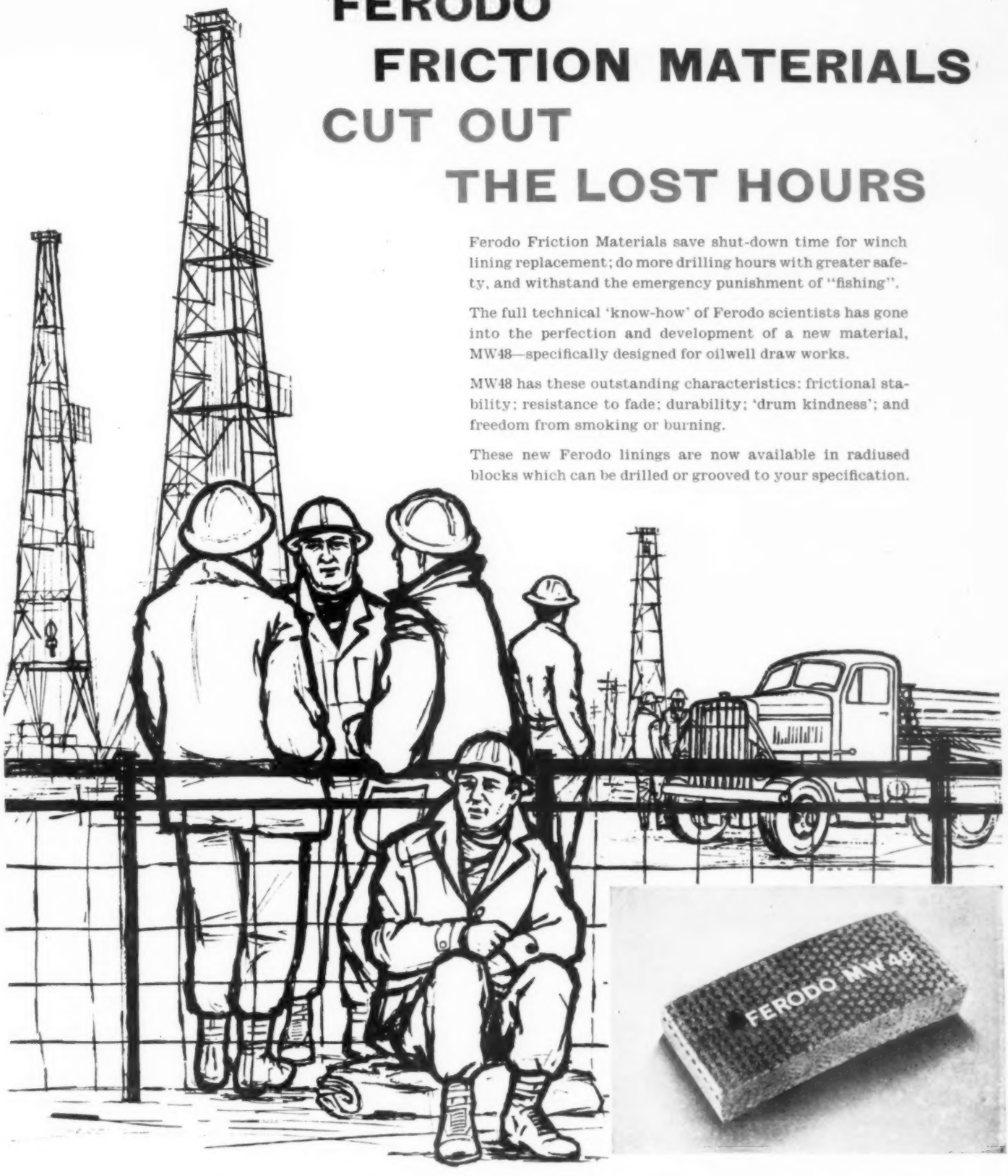

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(Continued from page 59)

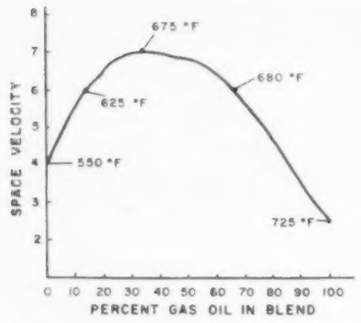

Fig. 3—Hydrodesulfurization of a blend of a reformer feed and a furnace oil. USA Patent 2,958,654, E. M. Honeycutt (to Sun Oil Co.)

junction with aluminum halide in Esso's 2,934,579 (G. E. Serniuk and C. E. Morrell). P. H. Johnson and K. L. Mills (2,963,527 to Phillips Petroleum Co.) claim a fluorided cobalt-molybdena-alumina catalyst.

An appreciable number of patents describes combination processes, involving an isomerization step. Typical are: U.O.P.'s 2,938,936 (D. H. Belden) and 2,952,716 (V. Haensel); Phillips Petroleum Co.'s 2,968,684 (H. J. Hepp and L. E. Drehman) and 2,938,935 (R. A. Findlay); Esso Res. & Eng. Co.'s 2,937,215 (L. Bleich and N. J. Weinstein).

DESULFURIZATION. The number of desulfurization patents has declined quite sharply and almost all of the reduction of effort seems to be in the field of hydrodesulfurization.

Liquid phase hydrodesulfurization of kerosine over cobalt molybdena alumina is described in Shell Oil Co.'s 2,947,685 (J. Koome and G. J. F. Stijntjes). Utilization of reformer hydrogen for desulfurization is discussed in Union Oil Co.'s 2,951,032 (T. V. Inwood). E. J. Kirberg (2,951,807 to Gulf Oil Co.) proposes a simultaneous hydrodesulfurization of straight run fuel oil and thermally cracked gasoline. D. K. Beavon (2,954,339 to Texaco) utilizes an arsenic poisoned cobalt-molybdena-alumina catalyst for hydrodesulfurization of cracked kerosine or gas oil. Desulfurization of a blend of a reformer feed and a furnace oil is the subject of Sun Oil Co.'s 2,958,654 (E. M. Honeycutt; see Fig. 3). Whole crude desulfurization is discussed in Standard-Vacuum Oil Co.'s 2,959,538 (J. Weikart, J. D. Bushnell, R. S. Wood and G. D. Ward). J. W. Scott, Jr. and F. M. Hazard, Jr. (2,932,611 to California Research Corp.) disclose a process of catalytic desulfurization and hydrocracking, followed by catalytic cracking.

A. P. Stuart according to Sun Oil Co.'s 2,951,034 desulfurizes with an adsorbent containing both, metallic nickel and nickel oxide or sulfide.

An aqueous mixture of caustic soda and formaldehyde is used by C. W. Rippie (2,952,627 to Ashland Oil & Refining Co.) to react alkyl sulfides in hydrocarbons. G. Nottes and E. Weiss (2,957,820 to Badische Anilin & Sodarfabriken) remove sulfur compounds from hydrocarbons by reaction with a sodium-sodium acetate. Sweetening with dried chromium oxide is disclosed by P. B. Murray in Sun Oil Co.'s 2,944,011.

A process for simultaneous desulfurization and coking of residual petroleum fractions is described in The Lummus Co.'s 2,968,611 (A. H. Schutte). G. W. Stamford and J. L. Patton of The M. W. Kellogg Co. (2,969,316) desulfurize reformer feeds in a complex combination process.

REFINING. As in previous years, this section deals with a variety of subjects, such as separation, purification and treating of hydrocarbons. The total number of patents was smaller during the past than in previous years. Particularly noteworthy is the sharp reduction of new separation, extraction and extractive distillation patents.

Separation procedures involving molecular sieves are described in a number of patents. Typical are Esso's 2,944,092 (G. F. Feldbauer, C. E. Jahnig and N. J. Weinstein) discussing the effect of pressure variation on operation and Union Oil Co. of California's 2,935,467 (R. N. Fleck and C. G. Wight) which is concerned with the adsorption-desorption cycle. A molecular sieve material suspended in aniline or triethylene amine is described in U.O.P.'s 2,957,927 (D. B. Broughton, H. S. Bloch and R. C. Wackher). Olefin separation with cobalt or silver substituted sieves is treated in Esso's 2,971,993 (C. N. Kimberlin and W. J. Mattox).

R. G. Craig (2,956,092 to Houdry Process Corp.) discloses a method of removal of isobutene from butadiene, while J. D. James (2,971,036 to Esso Res. & Eng. Co.) is concerned with isoprene recovery. Sorption of straight-chain hydrocarbons on a condensation product of resorcinol and salicylaldehyde is discussed by R. B. Thompson in U.O.P.'s 2,944,093.

Separation of xylene isomers is repeatedly mentioned. Two Union Oil Co. of Cal. patents (2,951,104, W. D. Schaeffer and J. D. Wordie; 2,926,206 W. D. Schaeffer and W. S. Dorsey) employ Werner complexes to clathrate p-xylene. G. W. Ayers and W. A. Krewer (2,960,548 to The Pure Oil Co.) extract aromatics from hydrocarbons by means of glycol esters of keto-acids. W. W. Grimes (2,949,422 to Standard Oil Co., Ohio) uses 30% diethylene glycol and 70% phenol ethanol amine as a selective solvent for aromatics extraction. Sulfuric acid is proposed for the extraction of tertiary olefins according to Gulf Res. & Dev. Co.'s 2,968,682 (B. F. Crouse and A. C. Whitaker).

Purification. The use of solid sodium particles to remove traces of water or color bodies from hydrocarbons is described in Sun Oil Co.'s 2,927,950 (T. J. Mertes and R. V. N. Powelson), and M. W. Kellogg Co.'s 2,927,074 (B. D. Barger and J. A. Knaus).

A mixture of sulfuric acid, propionaldehyde and acetaldehyde is proposed to extract thiophene from light oils by H. J. Drake in 2,938,861 (to Bethlehem Steel Co.). O. Liethen and W. Rottig (2,956,090 to Ruhr-chemie A.G.) purify C_3-C_5 olefins by mild hydrogenation over iron type catalysts.

The methods of removal of nitrogen compounds from hydrocarbons by specific treatments involving phosphoric acid are disclosed in Shell Oil Co.'s 2,971,906 (A. B. Webster) and Esso Res. & Eng. Co.'s 2,944,063 (H. C. Paulsen).

Hydrofining. Quite a few methods for the upgrading of hydrocarbon fractions by hydrofining have been patented. H. L. Johnson, H. E. Reif and A. Schneider in Sun Oil Co.'s 2,938,857 treat cat. cracker feeds. W. G. Annable, W. L. Jacobs and R. M. Haines (2,963,420 to The Pure Oil Co.) improve olefinic gasoline blending components. Treatment of deasphalted oils is disclosed in Texaco's 2,973,313 (E. F. Pevere, M. D. Riordan and N. D. Carter).

Metals Removal. C. D. Shiah (2,941,939) treats light oils with a boron trifluoride compound to remove metallic impurities. In Sinclair Refining Co.'s 2,951,035 (W. F. Lorenc, C. D. Keith and W. P. Hettinger) non-magnetic hematite is used to remove metals from residua, while R. P. Northcott and R. Lester in British Petroleum Co.'s 2,970,957 propose spent cobalt molybdate catalyst for this purpose. Combination distillation, extraction and sorption processes are discussed in Esso Res. & Eng. Co.'s 2,943,048 (J. H. Rust and H. Bieber) and U.O.P.'s 2,944,013 (D. L. Holden).

Gasoline Additives. Two typical patents in this area are: Standard Oil Co. of Ohio's 2,958,591 (A. L. Jones, W. B. Howsmon and E. C. Hughes), dealing with an anti-icing compounds comprising dimethylformamide and a boron compound; and Esso's 2,962,365 (J. J. Kolfenbach and J. O. Smith) piston cleaning additive containing nitrocyclohexane and tridecyl alcohol.

Removal of Acetylenes from Olefins. W. Kroenig and G. Scharfe (2,930,823 to Farbenfabriken Bayer) polymerize acetylenes in C_3-C_5 olefins by agitation with cuprous salt solutions under pressure. H. B. Fernald (2,953,608 to Gulf Res. & Dev. Co.) removes acetylene from ethylene over copper oxide on silica gel. An alkalized iron oxide-chrome oxide catalyst removes acetylenes from butene-butadiene streams in the presence of steam, according to Neches Butane Products Co.'s 2,969,407 (M. L. Rosenberg, C. R. Everett and J. B. Hutto).

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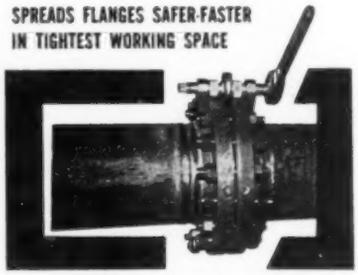

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Eastern European Process Plants

(Continued from page 52)

output was: iron metallurgy, 10.0%; households and communal buildings, 10.0%; chemical industry, 2.5%. Only 22.5% of the 1960 gas output was accounted for; the utilization of the remaining 77.5% was not revealed.

During the current 7-year plan (1959-1965) emphasis is laid on the creation of new capacities. A total of 100 billion (old) rubles ($25 billion) will be spent on the construction or extension of 300-odd plants and factories.

In 1960, Yugoslavia's three oil refineries (combined crude capacity—39,200 b/d) turned out 1,288,379 tons (25,011 b/d) of products. In 1957, they processed one million tons (19,369 b/d) of crude; in 1939 it was 47,000 tons (910 b/d).

Pancevo, near Belgrade, was chosen as the site for a fourth refinery to be built during the next few years. Planned capacity is 1.2 million tons (24,000 b/d). Crude stock will come from near-by Voivodina fields, and the Danube River will serve for distribution of products.

The three existing refineries, at Rijeka, Bosanski Brod, and Sisak, have been constantly expanded and modernized. In 1960 crude capacity of Sisak was increased from 7,200 b/d to 10,600 b/d, of Bosanski Brod from 6,600 b/d to 20,000 b/d.

Petrochemicals: Yugoslavia's first petrochemical plant will be built near Zagreb. Raw material will be natural gas from newly discovered Struzec oil field.

Construction will be financed with a $23 million loan from the USA Fund for Economic Development. Planned initial capacity is 15,000 ton/yr of polyethylene and polystyrene, and 15,000 ton/yr for other basic materials for the production of fibers, detergents, and rubber. After the plant's completion, Yugoslavia expects to cover domestic demand and be able to export some products.

Detailed information on individual refineries and petrochemical plants in the Eastern European countries will be found in the complete plant listings on other pages in this issue. (EN)

GSI Office In Australia

A new supervisory office in Brisbane, Queensland, Australia, has been announced by Geophysical Service Inc., the petroleum exploration subsidiary of Texas Instruments Inc. The office is headed by E. J. Malovich. Address is Kratzman Building, 52 High Street, Toowong, Brisbane, Queensland, Australia.

Independents Warn Majors

The American oil industry still is studying the speech of R. L. Foree of Dallas, Texas, who gave the keynote talk at the May meeting of the Texas Independent Producers and Royalty Owners Association.

Warning that major companies need the independent producers, Foree asked for fair play for the independents. If it does not come, he said, the independents can shoot at the foreign tax credit and foreign depletion, ask government subsidies for independent domestic producers, back up proposals to exempt some 3,800 smaller natural gas producers from price control, or complain to the U. S. Anti trust Division on crude oil buying practices of major oil companies.

What bothered Foree the most, it appears, was the practice of majors detaining less crude in Texas, but more in Louisiana and elsewhere. He seems to have at least a suspicion that in Louisiana they are producing and using their own oil, but that when they take it from Texas, they must buy more of it.

Foree, an outspoken and influential independent producer wound up asking whether "we should not seriously reconsider our policy of going along."

Tanker Wage Minimum

Starting Sept. 3 about 100,000 seamen on U.S. flag vessels come under the minimum wage laws, but not the overtime provisions of those laws. This is the final outcome of the two-year fight over the minimum wage measure.

About half the seamen covered work on the high seas and the other half on inland waterways and harbor vessels, it is estimated. Up to the present, all seamen have been exempt from the minimum wage laws due to the nature of their work.

As newly-covered employees, the seamen must at least receive $1 an hour starting September, 1961; $1.15 an hour by September, 1964; and $1.25 by September, 1965. The seamen are exempt from the overtime features of the act. In general, wages of most seamen are above the minimum levels.

The new minimum wage act specifies that the minimum or more must be paid when the seaman is "actually on duty" such as on watch, performing work, or standing by, but not when he is off duty, although aboard the ship. An effort to extend the coverage of the act to foreign flag vessels collapsed almost as soon as it started.

Goodrich Iranian Facility

Production has begun in a major manufacturing facility, a $7-million tire plant erected near Tehran by B. F. Goodrich Iran, S.A. The plant was built in association with a group of prominent Iranian investors. It is the third tire plant to be built and put into operation by B. F. Goodrich foreign subsidiaries in 13 months.

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MILFORD HAVEN, SOUTH WALES: In the foreground the Angle Bay Terminal of the British Petroleum Company. Tanks supplied by Motherwell Bridge & Engineering Company Ltd., and erected by Mothercat (Britain) Ltd. The tanks are located in an old fortification. In the background the new Esso Refinery at Milford Haven, where the same organization supplied and erected approximately one third of the tankage amounting to approximately 6600 tons.

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INTERNATIONAL NEWS AND NOTES

ALASKA—Standard Oil Co. of California, Western Operations, Inc., announced an increase of 20¢ per bbl in the price it posts for crude from the Swanson River oil field, effective April 17. The price boost will open the door to a substantial increase in royalty income to Alaska this year, with more to come as production increases. Production from the Swanson River field has increased steadily since oil was discovered there in 1957. More than $35 million had been invested in the venture by Standard, Richfield, and two other participating oil companies.

AUSTRALIA—Oil search subsidies in 1960-1961 should reach 1,400,000 Australian pounds (one pound equals $2.26). Some 1,002,000 has been committed for 1961-1962. Five new subsidies, totaling nearly 500,000 pounds, have been granted to Australian, USA, and other oil-search firms recently. Phillips Petroleum Co. received 305,650 pounds of the total for its drilling and seismic operations in Queensland. Union Oil Co. of California received 66,642 pounds for an aeromagnetic survey of the Cabawin district in Queensland.

Two of the nine grants, worth 214,000 pounds, are for stratigraphic drilling and five worth 209,150 pounds are for seismic survey operations. Another 4,000 pounds was for a gravity survey in the Artesian Basin of the Northern Territory. The Union Oil grant brings the total to 493,792 pounds.

Phillips Petroleum Co. is about to start drilling for oil 20 miles from Quilpie in Southwestern Queensland, Australia. Delta Drilling Co. of the United States will handle the job, and Sunray Mid-Continent Oil Co. will share in the costs.

The area was chosen after Phillips reported spending $2,250,000 in surveying its 35,000-square-mile prospecting lease in Queensland.

AUSTRALIA—Drilling has started at Combarngo, 70 miles northwest of the Tara area where the Cabawin No. 1 well is producing oil. Mines Administration Pty Ltd. is drilling the hole. Phillips Petroleum Co. has started a new well at Buckabie, 30 miles north west of Quilpie. Queensland's oil search will get a further boost when drilling starts in June on Mornington Island. Santos Ltd. and Delhi Australian Petroleum are running the operation. Drilling will go to 6,000 ft.

EGYPT—Eastern Petroleum Co. is "optimistic" after a 15 minute drill stem test yielded 40 bbls of 31.3 API gravity crude oil from 7,950 ft in M 1 in the Belayim field in the Gulf of Suez, it is reported. The well is nine kilometers offshore from the Belayim field of Sinai.

INDIA—An Indian Institute of Petroleum under the Council of Scientific and Industrial Research is being planned at a cost of $5,640,000 in the first five years. It will have two main technical divisions, one on gas and oil refining and petrochemistry and the other on petroleum products application. The French Institute of Petroleum has sent experts to help set it up and has offered to train 16 Indian scientists at Paris. Dr. J. W. Whitaker is planning officer of the new venture.

IRAN—Pan American International has abandoned its second wildcat in Iranian waters off the Persian Gulf, after having reached total depth of 12,497 ft. First well on the concession is still being tested.

ITALY—With final returns in, Italy registered crude production during 1960 of 1,998,126 tons (something under 40,000 b/d). Of this, 75,000 was used directly as fuel, 516,375 exported, and 1,234,035 tons processed by Italian refineries. Gulf Italia's contribution was 70%, ENI's Gela field 27%, and Po valley fields 3%—with Alanno (Abruzzo) output insignificant. Indigenous production covered only 4% of refinery runs. Imports to cover required inland needs, bunkers, and exports, amounted in 1960 to 29,465,783 tons (about 590,000 b/d) against 25,101,946 in 1959.

LIBYA—Libya's success ratio has been better than one producer to three dry holes, according to Libyan Petroleum Commission. As of April 1, 1961, holes drilled or drilling totaled 242, of which 87 had been completed oil producers, though not all of them have been commercial.

NIGERIA—The importance of Nigerian crude to the Shell group is now greatly enhanced with the completion by Shell-BP Development Co. of Nigeria of the new 414,000-bbl terminal at the mouth of the Bonny River, with its adjacent installations, and the 12-in. 18½-mile pipeline from Bomer to Bonny. A channel 28 ft deep has been dredged through the Bonny Bar, allowing the passage for the first time of fully-loaded 18,000-ton tankers. These projects have cost £2 million and have taken almost two years to complete.

PAKISTAN—Russian exploration in Pakistan should be in full swing by year-end 1961, according to Z. A. Shutte, Pakistan's minister of fuels and power.

PHILIPPINES—The USA said it is "seriously concerned" over Philippine Senate Bill No. 622 "to stabilize the supply of petroleum products" in the islands. The USA Embassy sees in it "discrimination against American firms" by freezing non-Filipino firms to their 1957 levels of operation. USA objects to provisions to grant refinery quotas only to enterprises authorized to do business in the Philippines as of 1960. Also, American officials say if the measure were enacted, a "significant portion of existing plants financed by foreign capital would be rendered inactive" and this would "discourage new flow of private capital" to the area. The Chamber of Commerce of the Philippines, and the Philippine Chamber of Industries as well, came out for the measure, but with amendments to give more favorable treatment to established oil companies. Officials of Standard Vacuum Oil Co., Filoil Refinery Corp., and the Petroleum Dealers of the Philippines have testified on the measure.

American Asiatic Oil Corp., Leonides S. Virata, has announced the discovery of oil at Daanbentayan, Cebu Island, in the central Philippines. The first shallow strike was made on March 10 at a depth of only 244 ft. Five subsequent production tests were conducted in the presence of Bureau of Mines representatives, and preliminary findings indicate a potential yield of 150 b/d from this hole.

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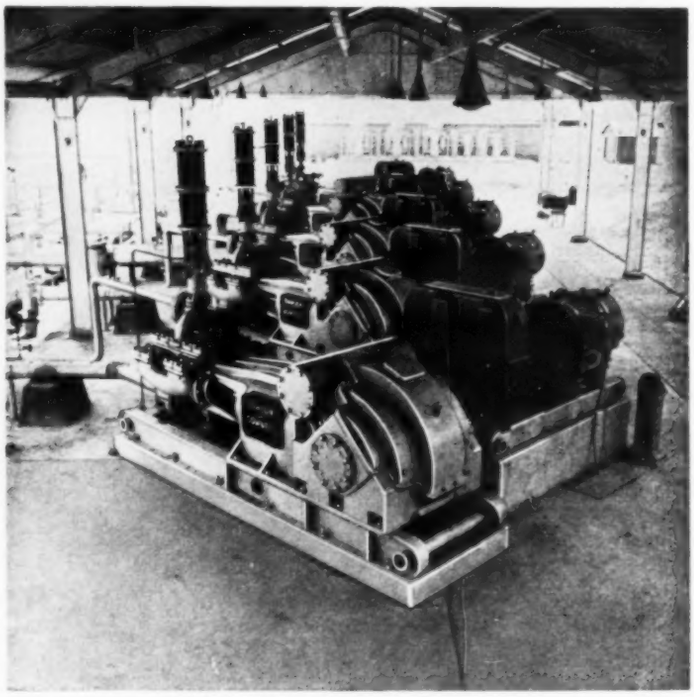

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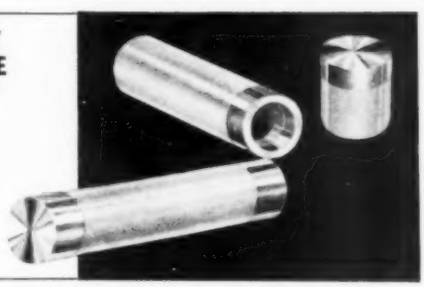
to 2½in o.d. x 2in i.d.

Minimum wall thickness ¼" all in 12ft lengths



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Alberta Government Nets $11 Million

The Swan Hills-Judy Creek Beaverhill Lake oil producing regions of Northern Alberta continues to attract the oil and gas industry.

Late in April, the Alberta Government sold more than 40,000 acres of petroleum and natural gas leases for cash bonuses of $11,134,020.44.

Of the 27 firms and groups obtaining successful bids, Imperial Oil Ltd. tendered $3.2 million for parcels in the Judy Creek area. Top price per acre in this area averaged $2,036.

Mobil Oil of Canada, Ltd. paid $1.7 million for three tracts in the Carson Creek area. Pan American Oil Corp. paid out bonuses totaling $1.3 million, Hudson's Bay Oil and Gas Co. Ltd., piad $1.1 million for parcels in the Swan Hills area, and Atlantic Refining Co. paid $1 million for two parcels in Carson Creek .

Personals

W. O. TWAITS has been re-elected president and chief executive officer of Imperial Oil Ltd. Other officers re-elected were: J. A. Cogan, L. D. Fraser, T. F. Moore and V. Taylor, vice presidents. Other directors are: J. A. Armstrong, C. E. Carson, J. W. Hamilton, A. C. Harrop and D. S. Simmons.

LEONARD R. WOOLSEY was appointed vice president of marketing for British American Oil Co. Woolsey has been general manager of marketing for B-A since 1958.

He was born in Saskatchewan and is an engineering graduate from the University of Saskatchewan. Following his graduation, he joined B-A as salesman and served in several capacities prior to his elevation to his new position.

JACK W. HUDSON has been elected vice president and general manager of Britalta Petroleums Ltd., Calgary, replacing **CLAUDE E. PEAVY**, who retired on May first. **NATE GOODMAN** has been named production superintendent.

Hon. W. Gagnon, CBE

Smiley Raborn, Jr.

W. P. Scott

HON. WILFRID GAGNON, C.B.E., W. P. SCOTT, and SMILEY RABORN, Jr., have been elected directors of Trans-Canada Pipe Lines Ltd.

MICHAEL D. REDDIN has moved up to chief development engineer, Canadian Operations, for Richfield Oil Corp.. Mr. Reddin received his early schooling in Prince Edward Island and is a graduate of University of Oklahoma. He joined Richfield in 1954.

The appointments of **GEORGE W. WOODS** as vice president and treasurer and **DONALD G. CLARK** as vice president, sales, have been announced by James W. Kerr, board chairman and president, Trans-Canada Pipe Lines, Ltd.

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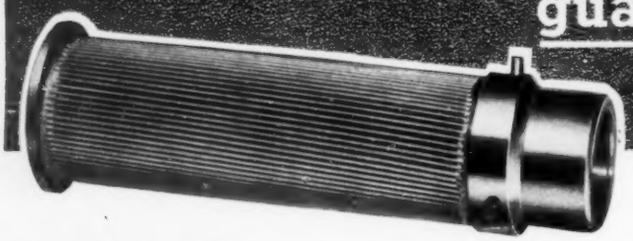

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The unique combination of properties found in Poroloy CM has led to its recent use in critical temperature conditions in the United States missile and aircraft industries, including installation in the Boeing 707.

POROLOY T.

Similar in performance to Poroloy CM but manufactured by a different process, Poroloy T has an operating temperature range from —400°F to 1500°F. Pore size ratings are from 2 to 250 microns and tensile strength varies from 2,000 to 100,000 p.s.i.

This illustration shows the many sizes and forms—seamless tubes, flat discs, corrugated elements etc.—in which Poroloy can be manufactured.

Both filter elements are manufactured in conditions of micro-cleanliness and before despatch are individually checked for performance in bubble point testing equipment.

Poroloy was developed by the California Institute of Technology and is manufactured in the U.K. under license from The Bendix Corporation, U.S.A.

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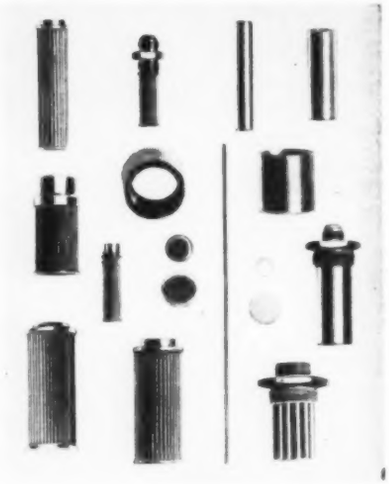

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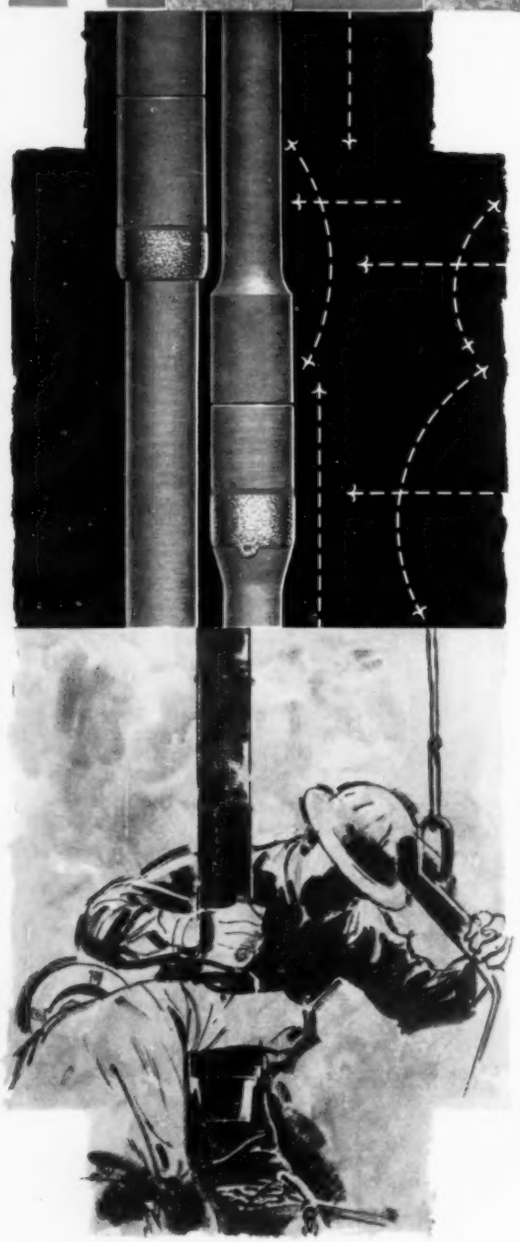

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